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Introduction to Actuarial Science*

By H. A. Finney

In the more comprehensive meaning of the term, actuarial science includes an expert knowledge of the principles of compound interest as well as the laws of insurance probabilities. Public accountants, however, are usually interested only in the interest phases of actuarial science, leaving the application of the laws of insurance probabilities to the actuary, who ascertains the measurement of risks and establishes tables of rates. This discussion of actuarial science will, therefore, be restricted to the phases thereof which deal with compound interest.

There seems to be a more or less prevalent belief that the exacting of compound interest is illegal, and that this illegality makes the mathematics of compound interest an impractical matter of purely academic importance. While it may be illegal in some jurisdictions for a creditor to charge the debtor interest on unpaid interest, there can be no legal restriction against the collection and reinvestment of the interest. In fact, the mathematical theory of investment is based on the assumption that all interest accretions become themselves a part of the investment, being converted at periodical intervals into interest-earning principal. The compound interest basis is the only scientific one where the accumulation or reduction of an investment extends over a series of periods. It is with compound interest, therefore, and not with simple interest, that actuarial science deals.

Interest is the increase in investment or indebtedness caused by the use of money or credit. The rapidity and extent of the increase depend on the factors of interest, which are rate, frequency and time.

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The rate is usually expressed in terms of percentage and measures the fraction by which the investment is increased at each date of conversion of interest. Thus, a rate of 5% per period indicates that the interest each period will be .05 of the investment at the beginning of the period; or, stated in another way, the investment at the end of the period will be 1.05 times the investment at the beginning of the period. Expressing the decimal interest rate by the symbol i (for instance, .05=i), the interest earned during any period may be computed by multiplying the investment at the beginning of the period by i; and the increased investment at the end of each period may be computed by multiplying the investment at the beginning of the period by $1+i$. The symbol $1+i$ is called the ratio of increase, because it measures the ratio existing between the investment at the beginning and the investment at the end of each period.

The frequency is the length of the period in years, months or days between the dates of interest conversions. It is evident that the frequency of compounding will materially affect the rapidity with which an investment increases. For instance, an investment of $1.00 for one year will amount to more if the loan is at 1½% per period of 3 months than if at 6% per period of 12 months.

Increase during one year in investment of $1.00 at 1½% per period of 3 months:

	1.00	Original investment
Multiply by	1.015	Ratio of increase
	1.015	Investment end of 3 months
" "	1.015	
	1.030225	" " " 6 "
" "	1.015	
	1.045678	" " " 9 "
" "	1.015	
	1.061364	" " " 12 "

Increase during one year in investment of $1.00 at 6% per period of 12 months:

	1.00	Original investment
Multiply by	1.06	Ratio of increase
	1.06	Investment end of 12 months.

One frequently sees interest tables in which the interest rates are stated as a certain per cent. per annum. It is better to express the rate as a certain per cent. per period, because, when the compounding occurs more frequently than once a year, the effective rate earned during a year is really greater than the nominal rate. Thus, in the foregoing illustration, the loan is made at 1½% per period of three months. The customary statement, however, is that the rate is 6% a year compounded quarterly. The nominal rate is 6%, but since the investment increases during the year from 1.00 to 1.061364, the effective rate per annum is 6.1364%.

The time is the total number of periods over which the investment extends. It is customary in commercial parlance to state the time as a certain number of years, but as a matter of principle the time is a certain number of periods which may be of any duration, and the rate should, therefore, be stated as the rate per period. For instance, if money is lent at 6% per annum for 4½ years, compounded semi-annually, the time (represented by the symbol n) is 9 periods, and the rate (represented by i) is 3% per period.

Each dollar of an investment increases in the same ratio as every other dollar; therefore, in compound interest computations, it is customary to compute the required value on the basis of a principal of $1.00, and to multiply by the number of dollars in the principal.

The Amount of 1.

Since interest increases the investment, the fundamental problem in interest is the computation of the amount to which an investment will increase in a given time. It has already been noted that the increase depends upon i (the rate per period) and n (the number of periods). During each period the investment increases in the ratio of $1+i$. At 6% per period, an investment of 1 will amount, at the end of 1 period, to 1.06, or $1+i$; during the next period the investment will increase to 1.06, the investment at the beginning of the period, multiplied by 1.06, the ratio of increase, or to 1.1236, which is $(1+i)^2$; at the end of the third period the investment will amount to 1.1236, the investment at the beginning of the period, multiplied by 1.06, or 1.191016, which is $(1+i)^3$. Or, stated generally, the investment will amount, at the end of n periods to $(1+i)^n$.

This means that the ratio of increase is raised to the *n*th power, or that the amount is a product obtained by using the ratio of increase as a factor as many times as there are periods. Representing the amount of 1 by *a*, the formula is

$$a=(1+i)^n$$

When compound interest tables are available, the amount can be determined by reference to them. A table of amounts appears as follows:

AMOUNT OF 1 AT COMPOUND INTEREST

Periods	3%	3½%	4%	4½%	5%
1	1.030000	1.035000	1.040000	1.045000	1.050000
2	1.060900	1.071225	1.081600	1.092025	1.102500
3	1.092727	1.108718	1.124864	1.141166	1.157625
4	1.125509	1.147523	1.169859	1.192519	1.215506
5	1.159274	1.187686	1.216653	1.246182	1.276282
6	1.194052	1.229255	1.265319	1.302260	1.340096
7	1.229874	1.272279	1.315932	1.360862	1.407100
8	1.266770	1.316809	1.368569	1.422101	1.477455

When interest tables are not available, the amount is easily computed by logarithms. To illustrate: what is the amount of 1 at 6% compound interest for 4 years, compounded semi-annually?

$a=1.03^8$

The logarithm of 1.03 is	.012837
To raise to the 8th power multiply by	8
The product is	.102696, which is the logarithm of 1.266764, or 1.03^8.

An interest table states this amount as 1.266770

When neither an interest table nor a table of logarithms is available, the amount may be computed by repeated multiplications. The required amount is the product obtained by using the ratio of increase as a factor as many times as there are periods. Thus, 1.03^8 may be computed as follows:

1.03				
1.03				
1.0609	Amount at end of		2	periods
1.03				
1.092727	"	"	3	"
1.03				
1.125509	"	"	4	"
1.03				
1.159274	"	"	5	"
1.03				
1.194052	"	"	6	"
1.03				
1.229874	"	"	7	"
1.03				
1.266770	"	"	8	"

This work can be materially reduced by recognizing the principle that the multiplication of any two powers of a number results in a power represented by an exponent equal to the sum of the exponents of the powers multiplied. For instance, $1.0609 = 1.03^2$.

Now since 1.0609 contains 1.03 twice as a factor, the product of 1.0609 multiplied by 1.0609 will contain 1.03 four times as a factor. Thus

$$1.0609 \times 1.0609 = 1.125509 = 1.03^4$$

The eighth power can be obtained thus:

	1.125509	The	4th	power
multiplied by	1.125509	"	4	"
	1.266770	"	8	"

The seventh power can be obtained by multiplying any powers, the sum of whose exponents is 7.

Thus:		Or:	
1.092727	The 3rd power	1.0609	The 2nd power
1.125509	" 4th "	1.159274	" 5th "
1.229874	" 7th "	1.229874	" 7th "

This principle may be applied when it is desired to determine an amount beyond the scope of an interest table. Thus, if an interest table extends only to 20 periods, the amount for, say, 75 periods, can be computed by multiplication of the amounts for periods within the scope of the table, as follows:

20th x 20th x 20th x 15th=75th

Or the principle may be applied when an amount must be computed with no table available. For instance, $(1+i)^{55}$ may be computed thus:

$$(1+i) \times (1+i) = (1+i)^{2}$$
$$(1+i)^{2} \times (1+i)^{2} = (1+i)^{4}$$
$$(1+i)^{4} \times (1+i)^{4} = (1+i)^{8}$$
$$(1+i)^{8} \times (1+i)^{8} = (1+i)^{16}$$
$$(1+i)^{16} \times (1+i)^{16} = (1+i)^{32}$$
$$(1+i)^{32} \times (1+i)^{2} = (1+i)^{34}$$
$$(1+i)^{34} \times (1+i) = (1+i)^{35}$$

The Compound Interest

Since the interest increases the investment, the difference between 1 and the amount of 1 is the compound interest. Representing the compound interest by the symbol I,

$$I = a - 1$$

Illustration: required the compound interest on 1 at 6% per annum for 4 years, compounded semi-annually?

The amount of 1.03^{8} has already been computed as 1.266770.

Then 1.266770—1=.266770 the compound interest.

The Rate

When the investment, the amount and the time are known, the rate can be computed by logarithms.

Illustration: if $80.00 invested at an unknown rate, compounded annually will amount to $107.20 in six years, what is the rate?

$80 \times (1+i)^{6} = 107.20$

Hence $(1+i)^{6} = 107.20 \div 80 = 1.34$

Since 1.34 is the 6th power of $1+i$, it is necessary to extract the 6th root, which is accomplished as follows:

log. 1.34=.127105

log. $\sqrt[6]{1.34}$=.127105÷6=.021184

.021184 is almost the exact logarithm of 1.05, or $1+i$

Hence i=.05 the rate.

The Time

When the investment, amount and rate are known, the time can be computed by logarithms.

Illustration: for how many years must $2,000.00 remain at 5% interest compounded annually to produce $5,054.00?

Since $5054=2000 \times 1.05^n$

$5054 \div 2000 = 1.05^n$

or $2.527 = 1.05^n$

log. 2.527=.402605

log. 1.05=.021189

.402605÷.021189=19, the number of years.

Present Value of 1

The present value of a sum due at a fixed future date is a smaller sum which, with interest, will amount to the future sum. When the time is more than one period, the smaller sum will accumulate at compound interest, increasing each period in the ratio of increase of $1+i$.

Representing the present value by the symbol p,

the accumulated sum at the end of 1 period will be $p \times (1+i)$

" " " " " " " 2 periods " " $p \times (1+i)^2$

" " " " " " " n " " " $p \times (1+i)^n$

Where the future sum is 1

$$p \times (1+i)^n = 1$$

and since $(1+i)^n = a$

$$p \times a = 1$$

or $p = 1 \div a$

That is, the present value of 1 due n periods hence at a given rate may be computed by dividing 1 by the amount of 1 for n periods at the same rate.

Illustration: what is the present value of 1 due four periods hence at 3%?

The table of amounts of 1 at 3% shows that $1.03^4 = 1.125509$.

Then 1÷1.125509=.888487, which is the present value of 1 at 3% for 4 periods as shown in the following illustrative table:

PRESENT VALUE OF 1

Periods	3%	3½%	4%	4½%	5%
1	.970874	.966184	.961538	.956938	.952381
2	.942596	.933511	.924556	.915730	.907029
3	.915142	.901943	.888996	.876297	.863838
4	.888487	.871442	.854804	.838561	.822702
5	.862609	.841973	.821927	.802451	.783526
6	.837484	.813501	.790315	.767896	.746215
7	.813092	.785991	.759918	.734828	.710681
8	.789409	.759412	.730690	.703185	.676839

When a table of present values is not available the value of p can be computed by dividing 1 by the value of a for the same time and rate, shown by a table of amounts of 1.

In the absence of any table, the value of p can be computed in one of the following ways:

Required: the present value of 1 due 4 periods hence at 3%. Compute the value of a, which in this case is 1.03^4, and divide 1 by the value of a.

$1.03^2=1.0609$

$1.03^4=1.0609^2=1.125509$

$1\div1.125509=.888487$

Or, use the ratio of increase as a divisor as many times as there are periods, using 1 as the first dividend, and each quotient as the dividend in the succeeding division; thus:

1÷1.03=.970874 present value of 1 due 1 period hence
.970874÷1.03=.942596 " " " 1 " 2 periods "
.942596÷1.03=.915142 " " " 1 " 3 " "
.915142÷1.03=.888487 " " " 1 " 4 " "

Or, divide 1 by the ratio of increase, and raise the quotient to the nth power; thus:

1÷1.03=.970874
.970874 x .970874=.942596 present value of 1 due 2 periods hence
.942596 x .942596=.888487 " " " 1 " 4 " "

COMPOUND DISCOUNT

The present value of 1 is the sum which will accumulate to 1 in a given time at a given rate. The difference between 1 and the

present value of 1 is the compound discount, which will be represented by the symbol D. The compound discount can be computed by the formula:

$$D=1-p$$

Illustration: required the compound discount on 1 due 4 periods hence at 3%.

The value of p for 4 periods at 3% was computed above. It is .888487.

Therefore 1—.888487=.111513, the compound discount.

This is the formula to use when one has a table of present values. If one has only a table of amounts of 1, it is better to use the formula:

$$D=I\div a$$

This formula requires explanation. The compound discount is really the compound interest earned on the present value. It is the interest which increases p to 1. For instance, if one lends .888487 for 4 periods at 3%, the interest will be .111513, increasing the investment to 1.

Now the interest earned is proportionate to the sum invested. If the investment is 1, the compound interest will be I. If the investment is half of 1, the compound interest will be ½ of I. If the investment is .888487, the interest will be I x .888487. That is, if the investment is p the earning of D will be $I \times p$. But p is $1\div a$.

Hence the formula:

$$D=I \times p$$

may be stated $D=I \times (1\div a)$

or $D=I \times \frac{1}{a}$

or $D=I\div a$

To illustrate the application of this formula: required the compound discount on 1 for 4 periods at 3%. Given: $1.03^4=1.125509$.

Then $.125509\div 1.125509=.111513$.

Annuities

A series of equal payments, due at regular intervals, is an annuity. The intervals may be periods of any length, as a month, a quarter, a half year or a year. The periodical payments of an annuity are called rents.

Since the rents may be invested when received, there is the problem of determining the amount to which the rents will accumulate. On the other hand it may be desired to compute the investment which, with interest accumulations, will permit the withdrawal of rents of stated amounts at stated intervals. The sum so invested is the present value of the annuity. These are the two fundamental annuity problems. The amount of an annuity of 1 will be represented by the symbol A; the present value of an annuity of 1, by the symbol P.

Amount of an Annuity

To illustrate the methods of computing the amount to which the rents of an annuity will accumulate, let it be assumed that a contract requires the following payments:

Dec. 31, 1916	$300.00
" 31, 1917	300.00
" 31, 1918	300.00
" 31, 1919	300.00

Required the amount to which these payments will accumulate at December 31, 1919, if each rent is invested immediately at 3% per annum.

Clearly the amount of the annuity will be the sum of the four $300 rents plus the interest on each rent, as follows:

Date	Rent	Periods at interest	Amount of 1	Amount of 300
Dec. 31, 1916	$300.00	3	1.092727	327.8181
" 31, 1917	300.00	2	1.0609	318.27
" 31, 1918	300.00	1	1.03	309.00
" 31, 1919	300.00	0	1.00	300.00
	1200.00			1255.0881

Although the amount of an annuity may be computed by determining the amount of each rent and the sum of these amounts, it is unnecessary to resort to this labor.

The following short method may be used:

To find the amount of an annuity of 1 for a given number of periods at a given rate, divide the compound interest on 1 for the number of periods at the given rate by the simple interest rate. Or, in symbols:

$$A = I \div i$$

applied to the foregoing illustration:

$1.03^4 = 1.125509$

Hence $I = .125509$

And $A = .125509 \div .03 = 4.18363$, the amount of an annuity of 1

$4.18363 \times 300 = 1255.089$, the amount of an annuity of 300

The accumulation of this annuity may be shown thus:

December 31, 1916	Rent	$300.00
" 31, 1917	Interest at 3% on $300.00	9.00
	Rent	300.00
	Total	$609.00
" 31, 1918	Interest at 3% on $609.00	18.27
	Rent	300.00
	Total	$927.27
" 31, 1919	Interest at 3% on $927.27	27.82
	Rent	300.00
	Total	$1,255.09

To understand the formula $A = I \div i$, it is necessary to consider the relation between compound interest and the amount of an annuity. To show this relation, we shall assume that the four $300.00 payments referred to in the preceding illustration represented the annual interest on $10,000.00 at 3%, the money being lent one year before the first interest payment was due. The four payments of $300.00 each, or $1,200.00 altogether, constitute the simple interest at 3% on $10,000.00 for four years. By investing each $300.00 payment at 3%, the creditor makes his investment pay compound interest, because he earns interest on the interest. The sum of $1,255.089 is, therefore, the compound interest at 3% for four periods on $10,000.00. It is also the amount of an annuity of four rents of $300.00 each, accumulating at 3%, as shown by the two foregoing solutions. Expressed formally as equations,

$1,255.089 = I$ on $10,000.00 (compound interest on $10,000).

and also

$1,255.089 = A$ of $300.00 (amount of annuity of $300.)

Dividing $1,255.089 by 10,000

$.1255089 = I$ on $1

$= A$ of $.03

Or, in other words, the compound interest on $1 at 3% for four periods is equal to the amount of an annuity of $.03 for four periods at 3%. Now, if .1255089 is the amount of an annuity of 3 cents for four periods at 3%, .1255089÷3 is the amount of an annuity of 1 cent for four periods at 3%; and .1255089÷.03 is the amount of an annuity of $1 for four periods at 3%. Since .1255089 is also the compound interest on 1 for four periods at 3%, represented by *I;* and since .03 is the interest rate, represented by *i,*

$$I \div i = A$$

Interest books usually contain tables showing the amounts of annuities, in the following form:

AMOUNT OF ANNUITY OF 1

Periods	3%	3½%	4%	4½%	5%
1	1.000000	1.000000	1.000000	1.000000	1.000000
2	2.030000	2.035000	2.040000	2.045000	2.050000
3	3.090900	3.106225	3.121600	3.137025	3.152500
4	4.183627	4.214943	4.246464	4.278191	4.310125
5	5.309136	5.362466	5.416323	5.470710	5.525631
6	6.468410	6.550152	6.632975	6.716892	6.801913
7	7.662462	7.779408	7,898294	8.019152	8.142008
8	8.892336	9.051687	9.214226	9.380014	9.549109

AMOUNT OF AN ANNUITY DUE

The above formula for determining the amount of an annuity applies only to an ordinary or immediate annuity. It must be modified slightly to be applicable to an annuity due.

An ordinary or immediate annuity is one whose rents are due at the ends of the periods. An annuity due is one whose rents are due at the beginnings of the periods. Since the last rent of an ordinary annuity is due at the end of the last period, no interest is earned after the payment of the last rent. But in the case of an annuity due, the last rent is paid in at the beginning of the last period, and hence all rents as well as the accumulated interest thereon bear interest for another period.

The difference between these two classes of annuities may be made more apparent by the following table comparing an ordinary annuity, the rents being payable at the end of each period, and an annuity due, the rents being payable at the beginning of each period.

Year	Ordinary annuity Rents due	Annuity due Rents due
1916		January 1
	December 31	
1917		January 1
	December 31	
1918		January 1
	December 31	
1919		January 1
	December 31	

It is evident that if the rents and the interest rates of the two annuities are the same, the amount of the four rents of the ordinary annuity, at December 31, 1919, will be the same as the amount of the four rents of the annuity due at January 1, 1919, because in each case there will be three interest accretions. But in the case of the annuity due, the entire amount accumulated at January 1, 1919, will earn interest for a full period to December 31, 1919, the end of the last period. This will cause an increase computed by multiplying by the ratio of increase, $1+i$. The formula for the amount of an annuity due is therefore:

$$A=(I\div i) \times (1+i)$$

This means that the amount of an annuity due may be computed by determining the amount of an ordinary annuity of the same rents for the same number of periods and at the same rate and multiplying this amount by the ratio of increase.

Illustration: if \$300 is deposited on January 1, 1916, 1917, 1918 and 1919, at 3%, what will be the amount of the annuity one year after making the last deposit?

$A=(.125509\div.03)\times1.03$

$=4.18363\times1.03$

$=4.309139$, amount of annuity due of 1

$4.309139\times300=1{,}292.74$, amount of annuity due of 300.

This method is a convenient one to employ when the amount of an ordinary annuity has been computed and it is desired to compute the amount of an annuity due of the same number of rents at the same rate per period. The amount of an annuity due for n periods may also be computed by determining the amount

of an ordinary annuity of $n+1$ periods and deducting one rent. Applying the method to the above illustration, the solution would be:

First, if a table of annuity amounts is available:

The table shows the amount of an ordinary annuity of four rents of 1 at 3%, to be 5.309136.

Then 5.309136—1=4.309136, the amount of an annuity due of four rents.

Second, if a table of annuity amounts is not available:

The amount of 1 at compound interest for five periods at 3% may be computed, or ascertained from a table. It is 1.159274.

Then .159274÷.03=5.309133, the amount of an ordinary annuity of 1 for five periods.

And 5.309133—1=4.309133, the amount of an annuity due of 1 for four periods.

And 4.309133×300=1,292.74, the amount of an annuity due of 300 for four periods.

The accumulation of this annuity may be shown thus:

January 1, 1916	Rent	300.00
January 1, 1917	Interest at 3% on 300.00	9.00
	Rent	300.00
	Total	609.00
January 1, 1918	Interest at 3% on 609.00	18.27
	Rent	300.00
	Total	927.27
January 1, 1919	Interest at 3% on 927.27	27.82
	Rent	300.00
	Total	1,255.09
January 1, 1920	Interest at 3% on 1,255.09	37.65
	Total	1,292.74

Sinking Fund Contributions

When the amount of each contribution to a sinking fund is computed on an actuarial basis, instead of on an arbitrary or a per-unit-of-output basis, the problem is to determine the periodi-

cal rents which will produce a required amount. The periodical contribution is computed by determining the amount of an annuity of \$1 for the given number of periods at the given rate. The amount of the required fund is then divided by the amount of an annuity of \$1. Representing the total fund by the symbol *S.F.* and the periodical contributions by *S.F.C.*,

$$S.F.C. = S.F. \div A$$

Since it is customary to deposit the periodical contributions at the ends of the periods, A usually represents the amount of an ordinary annuity.

Illustration: a company borrowed \$25,000.00 for four years, and provided for its repayment by establishing a sinking fund on a 3% basis, the contributions being made at the end of each of the four years. What was the amount of each contribution?

The amount of an ordinary annuity of 1 for four periods at 3% has already been computed at 4.18363.

Then $$SFC = 25{,}000 \div 4.18363$$
$$= 5{,}975.67$$

The following table shows the accumulation of the fund on a 3% basis:

SINKING FUND TABLE

End of 1st year:		
Contribution		5,975.67
End of 2nd year:		
Interest at 3% on 5,975.67:	179.27	
Contribution	5,975.67	6,154.94
Total		12,130.61
End of 3rd year:		
Interest at 3% on 12,130.61:	363.92	
Contribution	5,975.67	6,339.59
Total		18,470.20
End of 4th year:		
Interest at 3% on 18,470.20:	554.11	
Contribution	5,975.67	6,529.78
Total		24,999.98

Or the accumulation of the fund could be shown thus:

SINKING FUND TABLE

Year	Interest	Contribution	Total
1		5,975.67	5,975.67
2	179.27	5,975.67	12,130.61
3	363.92	5,975.67	18,470.20
4	554.11	5,975.67	24,999.98
Total	1,097.30	23,902.68	

If the contributions were made at the beginning of each period it would be necessary to divide the total fund by the amount of an annuity due.

Illustration: referring to the preceding illustration, what would be the amount of each contribution if the company made the deposits at the beginning of each year?

The amount of an annuity due of 1 for four periods at 3% has already been computed at 4.309139.

Then $S.F.C.=25{,}000\div 4.309139$

$=5{,}801.62$

The accumulation of the sinking fund may be tabulated as follows:

SINKING FUND TABLE

First Year:		
Beginning:	Contribution	5,801.62
End:	Interest on 5,801.62	174.05
		5,975.67
Second Year:		
Beginning:	Contribution	5,801.62
		11,777.29
End:	Interest on 11,777.29	353.32
		12,130.61
Third Year:		
Beginning:	Contribution	5,801.62
		17,932.23
End:	Interest on 17,932.23	537.97
		18,470.20

Fourth Year:

Beginning:	Contribution	5,801.62
		24,271.82
End:	Interest on 24,271.82	728.16
Total fund		24,999.98

Or the accumulation may be shown as follows:

SINKING FUND TABLE

Year	Contribution	Interest	Total
1	5,801.62	174.05	5,975.67
2	5,801.62	353.32	12,130.61
3	5,801.62	537.97	18,470.20
4	5,801.62	728.16	24,999.98
Total	23,206.48	1,793.50	

INTERIM INTEREST DATES

Sometimes the interest is compounded more frequently than the rents are payable. For instance, the rents of the annuity may be due annually, while the interest may be compounded semi-annually or quarterly. Such a problem offers no difficulty if one remembers that the nominal and effective rates per annum differ under such conditions.

Illustration: what is the amount of an annuity of four rents of \$100.00 each, payable at the expiration of a year, if the rents are invested at 6% per annum compounded semi-annually?

Although the rate is stated as 6% per annum, it is really 3% a half year. The ratio of increase each half year is, therefore, 1.03, and the ratio of increase each year is 1.03^2, or 1.0609. Hence the effective rate per annum is 6.09%.

The amount of 1 for four years at 3% a half year, is 1.03^4, or 1.266770; hence the compound interest is .266770. The amount of an annuity of 1 is computed as follows:

$$A = .266770 \div .0609$$
$$= 4.38046$$

And the amount of an annuity of 100 is 438.05.

The following table is set up by way of proof:

ACCUMULATION OF ANNUITY

First Year:			
End:	Contribution:		100.00
Second Year:			
Middle:	Interest on 100.00	3.00	
End:	" " 103.00	3.09	6.09
	Contribution		100.00
	Total		206.09
Third Year:			
Middle:	Interest on 206.09	6.18	
End:	" " 212.27	6.37	12.55
	Contribution		100.00
	Total		318.64
Fourth Year:			
Middle:	Interest on 318.64	9.56	
End:	" " 328.20	9.85	19.41
	Contribution		100.00
	Total (as above)		438.05

If the rents are payable at the beginning of each year the amount is first computed for a similar annuity in which the rents are due at the end of each year, and this amount is multiplied by the ratio of increase.

Illustration: Assuming that each of the $100.00 rents in the preceding illustration was payable at the beginning of the year, what would be the amount of the annuity at the end of the fourth year?

	438.05	Amount of annuity when rents are payable at end
Multiply by	1.0609	
	464.73	Amount of annuity when rents are payable at beginning

The following table is set up in proof:

ACCUMULATION OF ANNUITY

First Year:		
Beginning:	Contribution	100.00
Middle:	Interest on 100.00	3.00
End:	" " 103.00	3.09
Total		106.09
Second Year:		
Beginning:	Contribution	100.00
Middle:	Interest on 206.09	6.18
End:	" " 212.27	6.37
Total		218.64
Third Year:		
Beginning:	Contribution	100.00
Middle:	Interest on 318.64	9.56
End:	" " 328.20	9.85
Total		338.05
Fourth Year:		
Beginning:	Contribution	100.00
Middle:	Interest on 438.05	13.14
End:	" " 451.19	13.54
Total (as above)		464.73

The accumulation of interest at interim dates finds application in sinking funds which are accumulated by annual deposits, while the interest on the fund is compounded semi-annually. This is ordinarily the case with sinking funds, because the contributions are usually made annually, and the funds are invested in bonds bearing coupons payable semi-annually. To find the periodical contributions which will produce the required fund, compute the amount of an annuity of 1 by the process described in the preceding paragraph and divide the required fund by this amount.

COMPUTING AN UNKNOWN RATE

When the rents, the amount and the time of an annuity are known, it may be desired to compute the rate, as in the following illustration:

At what rate will an ordinary annuity of four rents of $100.00 amount to $418.36?

Problems of this nature are impossible of exact solution. Working with the formula for the amount of an annuity,

$$A=I\div i$$

we know the value of A, which in this case is 4.1836. The value of I is unknown, but substituting for I its equivalent $(1+i)^n-1$, in which the value of n is known to be 4, the knowns and unknowns can be stated as follows:

$$4.1836=\frac{(1+i)^4-1}{i}$$

This equation cannot be solved to obtain an exact value of i. Perhaps the best method of obtaining an approximation is by reference to a table showing amounts of annuities. A table shows the following amounts at various rates for four periods:

Periods	2%	2½%	3%	3½%	4%
4	4.121608	4.152516	4.183627	4.214943	4.246464

This table shows that the required rate is 3%. But assume that the table does not show this rate, and that the amounts nearest to the 4.1836 stated in the problem are

Rates	Amounts
at 3½%	4.214943
" 2½%	4.152516
differences 1%	.062427

Then a difference of 1% in the rate causes a difference of .062427 in the amount.

The amount at the unknown rate is 4.1836
and the amount at the next lower known rate is 4.152516

and the difference is .031084

If an increase of .062427 in the amount is caused by an increase of 1% in the rate, the increase of .031084 in the amount is caused by an increase in the rate of approximately

$\frac{.031084}{.062427}$ of 1%.

$$.031084\div.062427=.498$$

Hence the approximate rate is 2.5%+.498%, or 2.998%, which is very close to the true rate of 3%.

Computing an Unknown Time

When the rents, the amount and the rate of an annuity are known, the unknown number of periods can be computed by logarithms.

Illustration: in how many periods will rents of \$100.00 amount to \$418.36 at 3%?

Dividing \$418.36 by 100, the amount of an annuity of 1 is determined as 4.1836.

Applying the formula $A=I\div i$, or

$$A=\frac{(1+i)^n-1}{i}$$

the knowns and unknowns are

$$4.1836=\frac{1.03^n-1}{.03}$$

Multiplying both sides by .03 $\quad 4.1836\times.03=1.03^n-1$

or $\quad .125508=1.03^n-1$

adding 1 to both sides $\quad 1.125508=1.03^n$

Then by logarithms:

$$\text{log. } 1.125508=\text{log. } 1.03\times n$$

and $$\frac{\text{log. } 1.125508}{\text{log. } 1.03}=n$$

log. 1.125508 is .051346

log. 1.03 is .012837

$.051346\div.012837=4$, the number of periods.

Since 1.125508 is the amount of 1 for n periods at the known rate, and since 1.03 is the ratio of increase, $1+i$, the formula for computing the time required to produce a known amount of an annuity may be stated

$$n=\frac{\text{log. } a}{\text{log. } (1+i)}$$

Present Value of Annuity

The present value of an annuity is the sum which must be put at interest to produce the desired rents. This invested sum is increased by the interest accretions and decreased by the payment of the rents, the balance remaining at the date when the last rent is due being exactly sufficient to provide for the last rent.

Illustration: a contract requires the payment of $100.00 on December 31, 1916, and each year thereafter until December 31, 1919. What sum invested at 3% per annum one year before the first $100.00 payment is due will be sufficient to provide the four payments?

Clearly the sum will be less than $400.00 because of the interest. The present value of each of the four rents may be computed, and the sum of these present values will be the present value of the annuity. Thus:

Rent due	Rent	Periods present value earns interest	Present value at 3%
Dec. 31, 1916	100.00	1	97.0874
" 31, 1917	100.00	2	94.2596
" 31, 1918	100.00	3	91.5142
" 31, 1919	100.00	4	88.8487
Present value of four rents			371.7099

When the present value of an annuity is computed in this manner, the present value of the first rent may be computed by dividing the rent by the ratio of increase $(1+i)$. This present value is divided by the ratio of increase to determine the present value of the second rent; the quotient of each division serving as the dividend for the next succeeding division, thus:

100.00 ÷1.03=97.0874 present value of rent due 1 period hence
97.0874÷1.03=94.2596 " " " " " 2 periods "
94.2596÷1.03=91.5142 " " " " " 3 " "
91.5142÷1.03=88.8487 " " " " " 4 " "

371.7099 present value of the annuity

This method is too laborious to be employed when there are many rents, and the labor can be avoided by applying the following short method:

To compute the present value of an annuity of 1 for a given number of periods at a given rate, divide the compound discount on 1 for the same number of periods at the given rate by the interest rate. Representing the present value of an annuity of 1 by the symbol *P*,

$$P=D\div i$$

Applying this formula to the illustration, the first step is to determine the compound discount, D. A table of present values of 1, shows .888487 as the present value of 1 at 3% due four periods hence.

Then $1-.888487=.111513$, the compound discount;
and $.111513 \div .03=3.7171$ the present value of an annuity of 1
and $3.7171 \times 100=371.71$ the present value of an annuity of 100

The reduction of this present value may be tabulated as follows:

December 31, 1915	Present value	371.71
December 31, 1916	Interest at 3% on 371.71	11.15
	Total	382.86
	Rent deducted	100.00
	Balance	282.86
December 31, 1917	Interest at 3% on 282.86	8.49
	Total	291.35
	Rent deducted	100.00
	Balance	191.35
December 31, 1918	Interest at 3% on 191.35	5.74
	Total	197.09
	Rent deducted	100.00
	Balance	97.09
December 31, 1919	Interest at 3% on 97.09	2.91
	Total	100.00
	Rent deducted	100.00
	Balance	0.00

Or thus:

SCHEDULE OF REDUCTION OF ANNUITY

Date	Interest added	Rent deducted	Balance
Dec. 31, 1915			371.71
" 31, 1916	11.15	100.00	282.86
" 31, 1917	8.49	100.00	191.35
" 31, 1918	5.74	100.00	97.09
" 31, 1919	2.91	100.00	0.00
	28.29	400.00	

Interest books usually contain tables showing present values of annuities, in the following form:

PRESENT VALUE OF ANNUITY OF 1

Periods	3%	3½%	4%	4½%	5%
1	.970874	.966184	.961538	.956938	.952381
2	1.913470	1.899694	1.886095	1.872668	1.859410
3	2.828611	2.801637	2.775091	2.748964	2.723248
4	3.717098	3.673079	3.629895	3.587526	3.545951
5	4.579707	4.515052	4.451822	4.389977	4.329477
6	5.417191	5.328553	5.242137	5.157872	5.075692
7	6.230283	6.114544	6.002055	5.892701	5.786373
8	7.019692	6.873956	6.732745	6.595886	6.463213

In the absence of such a table, the present value of an annuity can be computed by repeated divisions to determine the present value of each successive rent, as illustrated above, or by applying the formula $P=D\div i$. If a table of present values of 1 is available, the value of D can be obtained by subtraction, thus:

1.00
.888487 present value of 1 at 3% for 4 periods.

.111513 compound discount at 3% for 4 periods.

If one has only a table of amounts of 1, the value of D can be computed by applying the formula $D=I\div a$, thus: The table of amounts of 1 shows:

$1.03^4=1.125509$

Then $.125509\div 1.125509=.111513$

Present Value of Annuity Due

If the rents are payable at the beginning of each period, no interest will be earned on the invested sum before withdrawing the first rent. Therefore it will be necessary to invest a larger sum than would be invested if the annuity were an ordinary one. The extra amount to be invested is equal to the interest earned on the present value of an ordinary annuity during the first period. Therefore, the present value of an annuity due can be computed by multiplying the present value of an ordinary annuity of the same number of rents at the same rate, by $1+i$, the ratio of increase.

Illustration: what sum must be invested on January 1, 1916, to permit the withdrawal of four rents of $100.00 each on the first day of January, 1916, 1917, 1918 and 1919? Interest at 3% a year.

This is an annuity due of 4 rents at 3%. The present value of an ordinary annuity of 4 rents of 1 at 3% was computed in the preceding illustration. It is 3.717099. Then $3.717099 \times 1.03 = 3.828612$, the present value of an annuity due of 1. And $3.828612 \times 100 = 382.86$, the present value of an annuity due of 100.

The reduction of this present value may be shown thus:

January 1, 1916	Present value	$382.86
	Rent deducted	100.00
	Balance	282.86
January 1, 1917	Interest at 3% on $282.86	8.49
	Total	291.35
	Rent deducted	100.00
	Balance	191.35
January 1, 1918	Interest at 3% on $191.35	5.74
	Total	197.09
	Rent deducted	100.00
	Balance	97.09

January 1, 1919	Interest at 3% on $97.09	2.91
	Total	100.00
	Rent deducted	100.00
	Balance	0.00

The present value of the annuity due for four periods is the sum of the first rent plus the present value of the last three rents. Therefore, when a table of present values of ordinary annuities is available, take the present value of such an annuity for n—1 periods and add one rent.

To illustrate: the annuity table shows

2.828611 Present value of ordinary annuity of 3 rents at 3%
Add 1.000000

3.828611 Present value of annuity due of 4 rents at 3%

Interim Interest Dates

In cases where the time between the withdrawals of rents is divided into smaller interest periods, as in an annuity where the interest is compounded semi-annually and the rents are withdrawn annually, consideration must be given to the difference between the nominal and the effective interest rates.

Illustration: what sum invested at 6% a year, interest compounded semi-annually, will produce four rents of $100.00, drawn annually, the first withdrawal being made one year after investing the present value of the annuity?

With eight interest periods and a rate of 3% per period, the first step in the solution is to find the present value of 1 due 8 periods hence at 3%. This is shown by a table of present values to be .789409. Then the compound discount is .210591.

The effective rate per year is computed thus:

$1.03^2=1.0609$ ratio of increase per annum.

And 6.09% is the effective rate per annum.

Then $.210591 \div .0609 = 3.45798$ present value of annuity of 1.

$3.45798 \times 100 = 345.80$ present value of annuity of 100.

The reduction of this annuity may be shown thus:

First year:			
Beginning:	Investment		345.80
Middle:	Interest at 3% on	$345.80	10.37
End:	" " " "	356.17	10.69
	Total		366.86
	Rent withdrawn		100.00
	Balance		266.86
Second year:			
Middle:	Interest at 3% on	266.86	8.01
End:	" " " "	274.87	8.25
	Total		283.12
	Rent withdrawn		100.00
	Balance		183.12
Third year:			
Middle:	Interest at 3% on	183.12	5.49
End:	" " " "	188.61	5.66
	Total		194.27
	Rent withdrawn		100.00
	Balance		94.27
Fourth year:			
Middle:	Interest at 3% on	94.27	2.83
End:	" " " "	97.10	2.91
	Total		100.01
	Rent withdrawn		100.01
	Balance		0.00

Present Value of Deferred Annuity

A deferred annuity is one which does not begin to run until after the expiration of a number of periods. For instance, an annuity of 5 rents deferred 10 periods is one which does not begin to run until after the expiration of 10 periods. If the

periods are a year in length, ten years will elapse before the first period in which a payment is to be made, and as the rents are ordinarily due at the ends of periods, the first rent will not be due until the end of the eleventh year.

To illustrate the method of computing the present value of such an annuity, assume that the 5 rents are $500 each, the annuity being deferred ten periods. The present value at 5% a year is desired.

The rents are payable at the end of the 11th, 12th, 13th, 14th and 15th years. If we were required to find the present value of the annuity at the beginning of the 11th year, the solution would consist merely of computing the present value of an ordinary annuity of 5 rents, as follows:

Present value of 1 at 5% in 5 periods=.783526

Compound discount .216474

.216474÷.05=4.32948 present value of ordinary annuity of 1.

By investing 4.32948 at the beginning of the 11th year it will be possible to draw out rents of 1 at each rent date. But since the annuity is deferred 10 periods the investment, made at the beginning of the first year, will earn interest for 10 periods before the beginning of the 11th year. Then if 4.32948 invested at the beginning of the 11th period will produce the annuity, the investment at the beginning of the first year need be only the present value of 4.32948.

Present value of 1 at 5% in 10 periods=	.613913
Multiply by	4.32948
Present value deferred annuity of 1	2.65792
Multiply by	500
Present value of deferred annuity of 500	1328.96

The method of procedure may be stated thus: to find the present value of an annuity of 1 for *n* periods deferred *m* periods, compute the value of an ordinary annuity of 1 for *n* periods and multiply by the present value of 1 due *m* periods hence.

Proof of the accuracy of 1328.96:

This investment earns compound interest for 11 years before the first rent is withdrawn:

	$1.05''=1.710339$	
	Multiply by 1328.96	
	2,272.97	
Deduct 1st rent	500.00	
	1,772.97	Value end of 11th year
Add 5% interest	88.65	
	1,861.62	
Deduct 2nd rent	500.00	
	1,361.62	" " " 12th "
Add 5% interest	68.08	
	1,429.70	
Deduct 3rd rent	500.00	
	929.70	" " " 13th "
Add 5% interest	46.49	
	976.19	
Deduct 4th rent	500.00	
	476.19	" " " 14th "
Add 5% interest	23.81	
	500.00	
Deduct 5th rent	500.00	
	0.00	" " " 15th "

Rents Produced by Known Present Value

An annuity problem of frequent application is the determination of rents produced by a known present value. To illustrate: if $5,000.00 is invested at 5% a year, what rents can be withdrawn at the end of each of 10 years?

If it were desired to withdraw rents of $1, the present value of an annuity of 1 for 10 periods at 5% would be invested. This

present value could be determined from an interest table, or computed. It is 7.721735.

Then 5,000÷7.721735=647.52 annual rent produced by investment of $5,000.

Hence to find the rents, divide the investment or known present value by the present value of an annuity of 1 for n periods at the rate i.

Equal Instalments in Payment of a Debt

The procedure explained above is used to compute the equal periodical amounts to be paid in settlement of the principal and interest of a debt.

To illustrate: assume that A borrows $5,000.00 from B at 5% and agrees to pay principal and interest in ten equal annual instalments, the first instalment to be paid at the expiration of one year. These ten payments are an annuity, and if A invested the $5,000.00 at 5% it would, of course, exactly provide the annual amounts which he could draw out and pay to B.

Since $5,000.00 is the present value of 10 unknown rents at 5%, and since 7.721735 is the present value of 10 rents of 1 at 5%

5,000.00÷7.721735=647.52 the equal instalment.

The reduction of the debt may be shown as follows:

Annuity Repayment of Debt

Year	Total	Payment		Balance of principal
		Of interest	On principal	5000.00
1	647.52	250.00	397.52	4602.48
2	647.52	230.12	417.40	4185.08
3	647.52	209.25	438.27	3746.81
4	647.52	187.34	460.18	3286.63
5	647.52	164.33	483.19	2803.44
6	647.52	140.17	507.35	2296.09
7	647.52	114.80	532.72	1763.37
8	647.52	88.17	559.35	1204.02
9	647.52	60.20	587.32	616.70
10	647.52	30.83	616.69	.01
	6475.20	1475.21	4999.99	

Leasehold Premiums

When the rental value of real estate has increased, the holder of a lease may prefer to sublet rather than to continue to occupy the property. If so, he takes as his gain the difference between the rent he pays on the original lease and the rent he receives on the sub-lease.

For instance, A owns property which he has leased to B for 20 years at $3,000.00 a year, payable in advance. At the expiration of the seventh year C wishes to occupy the property and is willing to pay $4,000.00 a year for it. Several different arrangements may be made.

B may sub-lease to C, collecting $4,000.00 a year, and paying $3,000.00 to A. C may pay $3,000.00 to A and $1,000.00 to B each year. He may pay A $3,000.00 a year, and pay B the present value of the thirteen payments of $1,000.00 each. The present value of these $1,000.00 payments is the premium paid for the lease.

Since the rent is payable in advance, the first rent is due. The premium to be paid is the present value of an annuity due of 13 rents. If B and C agree on 5% as the rate for discounting the annuity, the computation of the premium would be as follows:

$.530321 = V^{13}$ at 5%, present value of 1 due 13 periods hence at 5%

$.469678 \div .05 = 9.39356$, present value or ordinary annuity of 1

$9.39356 \times 1000 = 9{,}393.56$, present value of ordinary annuity of 1000

$9.39356 \times 1.05 = 9{,}863.24$, present value of annuity due of 1000.

Or as follows:

8.863252, present value of ordinary annuity of 1 at 5% for 12 periods, as shown by annuity table.

$8.863252 \times 1000 = 8{,}863.252$ present value of ordinary annuity of 1000

$8{,}863.25 + 1000 = 9{,}863.25$ present value of annuity due of 1000 for 13 periods.

C would charge this 9,863.25 to leasehold premium, and would write it off as scheduled below:

REDUCTION OF LEASEHOLD PREMIUM

Year	Debit rent	Credit interest	Credit leasehold premium	Balance
				9,863.25
1	1,000.00		1,000.00	8,863.25
2	1,000.00	443.16	556.84	8,306.41
3	1,000.00	415.32	584.68	7,721.73
4	1,000.00	386.09	613.91	7,107.82
5	1,000.00	355.39	644.61	6,463.21
6	1,000.00	323.16	676.84	5,786.37
7	1,000.00	289.32	710.68	5,075.69
8	1,000.00	253.79	746.21	4,329.48
9	1,000.00	216.47	783.53	3,545.95
10	1,000.00	177.30	822.70	2,723.25
11	1,000.00	136.16	863.84	1,859.41
12	1,000.00	92.97	907.03	952.38
13	1,000.00	47.62	952.38	
Total	13,000.00	3,136.75	9,863.25	

If the rents had been payable at the end of each year and the transfer of the lease had been made at the beginning of the year, the computation of the premium would be a problem of the present value of an ordinary annuity instead of the present value of an annuity due.

(*To be concluded.*)

Depreciation and Depletion in Relation to Invested Capital

By William B. Gower

Some interesting questions arise from treasury requirement (reg. 45 rev. art. 838) that the earned surplus and undivided profits of a corporation, forming part of its invested capital for purposes of profits tax calculations, must be "true" and must accord "full recognition" of all expenses and losses from the time of organization down to the taxable year, including depreciation of property and depletion of natural resources.

We are concerned particularly with the question as to what constitutes "true earned surplus and undivided profits" and what constitutes "full recognition" of depreciation and depletion of property during the period, be it long or short, covered by the entire life of the corporation down to the taxable year; whether present day rules adopted by the treasury for computing depreciation and depletion under the revenue act of 1918 are applicable necessarily to the anterior economic period during which a corporation accumulated its earnings and surplus; whether the prevailing tendency towards enhanced values of depreciable property (using the term "value" in either of its two different meanings of "value in use" and "value in exchange") has any bearing on the subject; and whether the present condition and value of depreciable property is a factor in the reckoning.

In order to understand clearly the treasury rule as to the bearing of depreciation of tangible property and depletion of property upon the invested capital of a corporation, it is necessary to state first the four elements which constitute invested capital, as defined by the statute. Broadly speaking, they consist of assets acquired with or represented by:

(a) The cash paid in for stock;

(b) The tangible property paid in for stock;
(at a value not exceeding actual cash value at the time of payment);

(c) The paid-in and earned surplus and undivided profits;

(d) The intangible property paid in for stock
(within limitations).

Neither the statutory definition of the elements (a), (b) and (d) of invested capital nor the treasury regulations appear to contemplate, either by direct expression or by implication, any diminution of these elements, per se, as expressions of original investments in depreciable property. So far as these three elements of invested capital are concerned, the present condition of depreciable property appears to be of no consequence—it may be abandoned or in ruins without affecting these elements. Apparently neither expiration of a portion of its useful life nor deterioration nor the complex of agencies working for impairment and destruction need be taken into consideration. Nor, on the other hand, is any expansion of these elements of invested capital permitted by reason of the action of natural and economic forces which may have resulted in appreciation over original cost-value. In a word, the present condition of property and its present value seem to have no bearing whatever upon these three elements of invested capital.

The view of the treasury regulations is that the remaining element of invested capital—(c) "earned surplus and undivided profits, not including surplus and undivided profits earned during the year"—is the one to which we must look for recognition of depreciation and depletion of property.

REGULATION: Only true earned surplus and undivided profits can be included in the computation of invested capital, and if for any reason the books do not properly reflect the true surplus such adjustments must be made as are necessary in order to arrive at the correct amount.

In the computation of earned surplus and undivided profits full recognition must first be given to all expenses incurred and losses sustained from the original organization of the corporation down to the taxable year, including among such expenses and losses reasonable allowances for depreciation, obsolescence or depletion of property (irrespective of the manner in which such property was originally acquired) and for the amortization of any discount on its bonds.

There can of course be no earned surplus or undivided profits until any deficit or impairment of paid-in capital due to depletion, depreciation, expense, losses or any other cause has been made good.

Before examining this regulation in detail we might point out that it would apply, undoubtedly, not only to corporations which claimed an earned surplus and undivided profits as part of their invested capital, but also to corporations which had distributed all their earnings to the shareholders and did not claim an existing surplus as part of their invested capital. In the latter event, if inadequate recognition of depreciation and depletion had occurred

in the profit and loss account, it would be held that a liquidation of capital had taken place, to which full effect must be given in reckoning invested capital under article 860 of the regulations.

(1) The opening phrase of the regulation insists that the earned surplus and undivided profits which a corporation claims as part of its invested capital shall be "true." There is no distinction of fundamental character between "earned surplus" and "undivided profits," for surplus is merely profits reserved from distribution. Broadly speaking, they represent in combination the accretions of wealth during the economic period derived from business conduct and dealings in property, as distinct from accretions derived from mere accessions of capital or from borrowed funds. The accretions of wealth must have been earned and must be in possession. It is in the sense of these necessary attributes of earned surplus and undivided profits that the treasury regulation applies the adjective "true" in the opening phrase.

The accretions of corporate wealth from the date of organization down to the taxable year are expressed by the difference between the total of the assets (less liabilities) at the beginning of the taxable year and the corresponding total at the commencement of corporate operations. To the accountant it is a comparison of balance-sheets and carries with it all the debatable questions which surround assets and the principles of their valuation. The main problems are well known namely:

(a) What items may be taken in as assets?
(b) What expenditures may be included in their cost price?
(c) In subsequent revaluations of assets, shall they be put down at the original acquisition price or the current market price or the present value in use to the corporation or the liquidating value or some other value?

For our immediate purpose we need consider only the one question as to the value to be placed in the balance-sheets on depreciable property, the so-called "fixed assets," by which are meant those which are acquired for permanent or long-continued use as instruments of production and service. The accounting rule is that in preparing the comparative balance-sheets for the purpose of verifying accumulated earnings over a given period, the fixed assets must appear consistently in each balance-sheet at their cost-value, that is to say not in excess of the cash paid

for them or in excess of the fair value at the time of acquisition if stock was issued in payment. Further, that changes in market value of fixed assets, the maintenance of which is provided for, may be ignored; but that depreciation (in the sense of amortization of cost-value, less estimated salvage) must always be taken into account. This accounting rule was adopted and has received general acceptance, in spite of the admitted objection that cost-value is no criterion of "value to a going concern" at a subsequent date.

Even though the established accounting rule were set aside, and depreciable property were valued in a later balance-sheet at a figure substantially greater than its cost-value or fair value at the time of acquisition—say at its estimated present worth—the difference would be considered an unrealized value-appreciation or increment which, as an accretion of corporate wealth, would not be accepted by the treasury as "earned surplus" or "undivided profits."

Let us assume the problems of valuation of assets in the balance-sheet solved by applying in each instance the principles which find the greatest support from the courts and recognized accounting practice and assume the extent of accretions of corporate wealth determined. We reach then the difficult questions involved in classifying the derivation of the accretions and determining what portion was derived from "earnings" and "profits," as distinct from other sources.

To the accountant, it is no longer a comparison of balance-sheets, assets and liabilities, but an examination of the complementary record contained in the summary of the economic accounts (profit and loss, surplus, distribution) from the date of corporate organization down to the beginning of the taxable year. Here again many debatable questions arise, for there are no exact and invariable standards of measurement accepted by the courts, financiers, accountants and economists. The difficulty increases with the length of the economic period during which the accumulations of earnings arose, which may be years or decades.

In the study of the economic summary the problems may be divided broadly between those relating to the credit side (we may instance the question whether or not realized and unrealized ap-

preciation of property values is earned surplus) and those relating to the debtor side, losses, expenses, charges and outlays.

The emphasis in the treasury regulation which we are now considering is on the debtor side of the accounts in the economic summary, the only reference to the credit side being contained in the opening caution that earned surplus and undivided profits must be "true."

(2) In dealing with the debtor side of the accounts in the economic summary (losses, expenses, charges and outlays) the treasury regulation confines itself to a requirement and an opinion. It requires "full recognition" of all expenses incurred and losses sustained from the organization of a corporation down to the taxable year, including depreciation, depletion, obsolescence and discount. It states an opinion that there can be no earned surplus or undivided profits until any deficit or impairment of paid-in capital due to any cause whatever has been made good.

Concerning the requirement for full recognition of expenses and losses as charges against the profit and loss account, accountants will assent, provided the expenses and losses are restricted to those which accounting practice recognizes as proper charges to profit and loss. For instance, there are certain losses, such as those arising from fire, shipwreck, default of capital investments, exploitation of natural resources, etc., which may be regarded as a loss of capital, rather than a loss of profits. Neither the decisions of our courts nor the practice of accountants confirms the opinion of the treasury regulation that there can be no profits until any deficit or impairment of paid-in capital, due to any cause whatever, has been made good. The accounting position has been stated by Professor Hatfield with concise and admirable lucidity in his standard work *Modern Accounting,* and his conclusion may be quoted:

> It may be logical to claim that *all* losses or gains, however caused, should go to profit and loss, and not direct to some other proprietorship account. But such a claim, while logical enough, does not at all conform to accounting practice of any land or time.

The form of expense which we term depreciation, however, is recognized by accounting practice as a necessary charge against profits; but the recognition is not so general in the case of depletion. We have now to consider what constitutes full recognition of these expenses from the organization of a corporation down to the taxable year.

Depreciation of Tangible Property

It has been said that the debtor side of the accounts in the economic summary contains the expressions of the decreases in corporate wealth which take place contemporaneously and necessarily in the efforts to increase the corporate wealth. This is a sufficiently correct generalization when applied to the entire economic life of a corporation, from organization to final liquidation, considered as an entity. It requires modification, however, when applied to each accounting period or year, the sum of which constitutes the operating history of the corporation. Particularly is this so in regard to periodic charges to profit and loss for the amortization of prepaid expenses and anticipation accounts and for the destruction of cost-value of fixed assets, for these periodic charges do not necessarily connote contemporaneous and commensurate decreases of wealth.

The cost-value of an instrumentality of production and service, a fixed asset acquired for long-continued use, less the net proceeds of final disposal, in an expense appertaining to the period of its useful life considered as a unit of time, because a decrease of wealth takes place. Custom demands, however, that this unit of time be divided into yearly portions and accounts be stated for each year. The decrease of wealth inevitable in the instrumentality does not take place, strictly speaking, until its usefulness is ended; for its value to the going concern is rarely less than its cost-value so long as it functions and provision is made for its maintenance. But the fact that the corporation suffers no decrease of wealth while the instrumentality functions and its maintenance is provided for does not constitute a sound reason for allotting the expense to the final year—one reason being that the instrumentality assists in producing revenue throughout its years of useful life, and it is only right that when this revenue is apportioned to yearly periods there should be charged against it some portion of the inevitable future decrease of wealth involved in the purchase and demise of the instrument. These apportioned charges year by year constitute what we term the expense for depreciation, and they are anticipations of future decreases of wealth.

These annual expenses for depreciation of tangible property, therefore, do not necessarily connote contemporaneous and equiva-

lent decreases of corporate wealth, but represent instalments in anticipation of future inevitable decreases of wealth, which will occur when the useful life of the property terminates. To justify these annual expense charges there must be a reasonable degree of certainty as to the occurrence in the future of a decrease of wealth by reason of the termination of the useful life of the property—in other words, that the proceeds of ultimate disposal will be less than cost-value.

Economists have a theory which is built up from the premise that fixed assets yield a series of fairly uniform services for a fairly fixed term of years. From this premise they argue that an analogy exists to a terminable annuity, the annual instalments of which represent the value of the services rendered during the year by the fixed assets. They conclude, therefore, that the fixed assets have a capital-value, that is to say the discounted value of the annual instalments of valued future services. They regard this capital-value as diminishing progressively as the date for the termination of the service approaches, and this progressive decline in capital-value is the depreciation of the fixed assets. All this is ingenious, no doubt, but the ground is too slippery for accounting practice. We have troubles enough in our work without concerning ourselves with "series of fairly uniform services" or abstract "values" of such services or analogies which lead us to the quagmire of "capital-values."

There is no connection, necessarily, between these annual expenses which we term depreciation and any fluctuations in value of the property during its term of life. To represent annual depreciation charges as the registration of contemporaneous decline in value is fallacious. No matter what concept of "value" is used, whether fair market value, liquidating value, value in use, or any other, mere fluctuations and changes during the term of useful life of property are disregarded in accounting, because the going concern is not affected thereby. The present value in use of a manufacturing plant erected in 1914 may be several times its cost-value; but this is not a phenomenon to be reflected in the economic accounts, nor does it warrant the discontinuance of annual provision through depreciation charges for the decrease in corporate wealth which is inevitable in the future, when its useful life is ended. Nor, if the present liquidating value of the

plant be only one-half of its cost-value, does it warrant the assumption that one-half of the cost-value should have been provided to date by depreciation charges against the income, unless, by chance, one-half of the useful term of life has expired.

The accumulated depreciation allowances at a given date do not pretend to measure a supposed diminution in value of the property since its acquirement; for if the useful life of the property is in full swing there is no decrease of corporate wealth which the accountant is called upon to recognize. Subtracting the accumulated depreciation from the cost-value of the property does not give a remainder which pretends to reflect present value, whether fair market value, liquidating value or utility value.

Accountants are responsible in a large measure for the prevailing erroneous ideas on this subject, for accounting literature is saturated with them, such as that present value of depreciable property is necessarily reflected in a balance-sheet; that the use of depreciable property compels a continuous and progressive shrinkage in its value; that depreciation allowances year by year reflect and measure this supposititious shrinkage in value, and that each annual instalment is a contemporaneous loss of some kind. The progress toward correct thinking on this subject cannot be better illustrated than by contrasting the language of the treasury regulations of 1914, 1918 and 1919, and observing the fundamental change:

> Reg. 33 Jany. 5, 1914.
> The deduction for depreciation should be the estimated amount of the *loss,* accrued during the year to which the return relates, *in the value of the property* in respect of which such deduction is claimed, that arises from . . .
> Reg. 33 rev. Jany. 2, 1918.
> The deduction for depreciation should be the amount of the *loss* occurring during the year to which the return relates, estimated on the cost of the physical property with respect to which such deduction is claimed, which loss results from . . .
> Reg. 45 rev. 1919.
> The necessity for a depreciation allowance arises from the fact that certain property used in the business gradually approaches a point where its usefulness is exhausted. . . . The capital sum to be replaced should be charged off over the useful life of the property either in equal annual instalments or in accordance with any other recognized trade practice.

In order to determine whether or not full recognition has been given in the profit and loss account to the expense known as depreciation of tangible property at a given date, we require only the following data: (a) the cost-value, (b) the probable amount

to be realized upon termination of useful life, (c) the term of useful life and (d) the expired term of useful life. Expressed algebraically the formula is

$$\frac{d\ (a - b)}{c}$$

The present-day value of the property does not enter into the question at all, except indirectly as bearing upon the factor (b), the probable amount to be realized upon liquidation when the useful life of the property ends, and perhaps to some slight extent in affecting the time when the property will be disposed of.

This basis of reckoning the expense known as depreciation of tangible property, in order to determine whether or not it has been fully recognized in the earned surplus at a given date, applies, even though in years subsequent to 1908 a corporation may have used a valuation higher than cost-value of the property in computing depreciation and reporting net income under the excise tax law of 1909 and subsequent income and profits tax laws. In recent years depreciation has been computed in many cases upon the fair market value of property as of March 1, 1913. This value was frequently higher than cost-value.

In such cases there has been recognition of two separate and distinct concepts—the first, an expense representing anticipated decrease of wealth based on extinguishment of cost-value; the second, recognition of another element which is not an accounting expense, but an allowance out of gross income to replace an arbitrary capital-value existing at March 1, 1913, being the appreciation in value of property at that date over its cost-value. The term depreciation is used to cover both elements, but there is a sharp differentiation between the two, for one is an element of true corporate expense, which must be recognized invariably in the economic accounts, while the other element is a mere allowance, an artificial product of income-tax legislation, born with the income tax, and assured of oblivion at its demise.

The existence of these two elements in present-day depreciation, the one a natural corporate expense, the other an artificial allowance out of receipts designed to recover appreciation in value at March 1, 1913, over original cost, is recognized expressly in article 844 of the regulations. The language of this article confirms, unreservedly, our opinion that in computing earned surplus

and undivided profits which may be included as invested capital, the reckoning of depreciation of tangible property is full and complete when based on cost-value. If a basis higher than cost has been used, and the surplus account has been reduced accordingly, the excess "may be treated as surplus and included in the computation of invested capital, if undistributed and used and employed in the business."

To sum up: the present condition and value of depreciable property has no bearing whatever upon corporate invested capital, nor is there any necessary relation between so-called depreciation allowances and changes in value of property to which such allowances relate. Tangible property may be included in invested capital at its full cost-value, no matter what its present condition and value is; but in certain cases, a portion of this cost-value must be deducted from invested capital. The cases referred to are those wherein the net assets which constitute the entire admissible invested capital, considered as an entity, were derived not only from paid-in capital but from earned surplus and undivided profits. In that event the amount representing the earned surplus and profits must be tested to see that a deduction has been made therefrom for the cost-value of property which has been used up and for a ratable share of cost-value (less estimated proceeds of final disposal) of property which remains in use, whose end is certain.

Stated in another way, no greater deduction from the earnings and profits accumulated by a corporation down to the taxable year is required, in the case of depreciable property, than would be required by a court of law in proceedings which involved the ascertainment of earnings and profits during the period—that is to say, the depreciation need not be based upon a value higher than cost-value.

Depletion of Natural Resources

The revenue act of 1918 provides that in computing taxable income there may be deducted a reasonable allowance for the depletion of natural resources, according to the peculiar conditions of each case, based upon cost, or in certain eventualities upon a higher value.

The interpretation which the treasury regulations give to depletion is that it involves the recovery or extinction or amortiza-

tion of a given capital sum out of income; and to this extent, and in this particular only, depletion is regarded as analogous to depreciation.

The treasury rule governing the allotment by years of the capital sum recoverable through depletion allowances is entirely different from the rule for the corresponding yearly allotment of depreciation of property. We have seen that the rule in the yearly allotment of depreciation requires a more or less equal share apportioned to each and every year of useful life. Specifically, the controlling factor is the time the wealth will last, in terms of consecutive years.

Nor is the allotment rule adopted by the treasury for depletion one which is accepted by accountants in apportioning to years any form of prepaid expenses, deferred charges to operation, bond discount or similar amortization, in all of which the number of consecutive years is controlling.

Neither did the treasury adopt an allotment rule for the depletion of natural deposits similar to that applied where a tract of land is purchased, divided into parcels and sold. The rule in that case requires an equitable apportionment of the capital sum among the several parcels and an extinguishment of the capital according to the respective lots sold. There are some analogies between the two classes of transactions which may not have received due consideration.

The treasury adopts as the governing rule in the yearly allotment of the capital sum representing the investment in natural resources the accounting method which would be applied to the ordinary purchase and consumption of a definitely known stock of materials (such as a quantity of pig iron or bricks or other commodity of uniform character and quality) which may be measured in its own special unit, the accessibility of each unit known within limits, the measurement of the three magnitudes of wealth (quantity, unit price and value) capable of being stated with reasonable accuracy, and where a diminution in quantity connotes a directly proportionate diminution in the fund capital. The allotment of the fund capital is made only to those years in which a diminution in quantity takes place, and the value extinguished in a given year is in direct proportion to the quantity removed during the year.

Certain investments in natural resources resemble closely the ordinary purchase and consumption of a stock of materials, and all the characteristics of such a transaction, as described above, are reproduced with reasonable approximation. The valuable content is known and determinable at the time of acquirement; it is the basis of the purchase; and there are no subsequent new discoveries.

But the great majority of investments in natural resources, particularly mineral deposits, do not fulfil originally the conditions or exhibit the characteristics of an ordinary purchase of a stock of materials for consumption in productive processes; the measurement of the three magnitudes of wealth (quantity, unit price and value) at the time of acquirement cannot be stated even approximately; nor is there a direct proportion between diminution in the number of valuable units and diminution in the nominal fund capital. In particular, these investments in mineral deposits frequently exhibit the phenomenon through long periods of time of a removal of large quantities of valuable contents unaccompanied by any shrinkage in the fund capital. The majority of these investments in natural resources contains two separate and distinct elements, the relative size of the elements varying with the character of the property and other extraneous conditions. One of these elements (the product in sight or reasonably certain) may resemble in some respects the ordinary purchase of a stock of materials; but the second element, frequently the larger of the two, is essentially different, for it is a speculation in future discoveries.

In order to put this latter class (the great majority) of investments in natural resources on a parity with the smaller class previously mentioned, and in order to maintain the analogy to the ordinary purchase and consumption of a stock of materials, the speculative element in the majority class has been specifically recognized in the revenue act of 1918, which provides that new discoveries of natural resources shall be taken into the reckoning of depletion at their fair market value at the date of discovery or within 30 days thereafter.

LAW: section 234 (a 9). In the case of mines, oil and gas wells, discovered by the taxpayer on or after March 1, 1913, and not acquired as the result of purchase of a proven tract or lease, where the fair market value

of the property is materially disproportionate to the cost, the depletion allowance shall be based upon the fair market value of the property at the date of the discovery or within thirty days thereafter.

The word mine has two different meanings, one being applied to a body of ore whether it is being worked or not and the other applying to the underground openings which furnish entry to the mine, facilitate searching for ore and open avenues for extraction. From the context of the law it is evident that the word mine is used in the sense of a commercially valuable deposit of ore or mineral, and this meaning is adopted in the regulations.

It is not so easy to decide the sense in which the term discovery is used in the statute, but evidently it must be read with the context calling for ascertainment of the fair market value of the property discovered, which demonstrates that the term imports the process of uncovering a commercially valuable deposit of ore or mineral through development, and not merely locating an ore body by prospecting.

Such discovery of mineral deposit is not limited to new prospects and mining claims, previously unproductive, but applies equally to development of unproved ore and minerals in a producing mine; for the statutory limitation excluding "purchase of a proven tract" (so far as the mining industry is concerned, where the term proven tract is unknown) can only apply to proved ore in a producing mining claim—that is to say, ore where there is practically no risk of failure of continuity.

Hence it follows that the term discovery as used in the statute, and applicable to mines, must apply to the development of all ore and mineral deposit beyond the range of vision and in the case of producing mines would cover the entire prospective value to be developed by extension of the deposit beyond a short distance from the last opening.

The development of this prospective value of a mineral deposit is a more or less continuous process, dependent upon a variety of conditions, such as the character of the deposit, the smelting or treatment capacity, the market for the product, the management, finance, business policy, etc. It follows that the discovery of commercial ore and minerals, whether in the prospecting or producing stage, is continuous in character, and the date of discovery (which the statute requires to be established) is an equally continuous affair.

All this is practical acceptance of the theory of depletion of mines set out at length by the writer in THE JOURNAL OF ACCOUNTANCY, August, 1918, in which it was contended that the fund capital to be returned is the intrinsic value of the content (in place, en bloc) which existed from the beginning, although much of it may have been latent, and determined only by "extension in depth"; and that the amount of depletion to be taken in each year during which valuable content is removed must be the number of units removed in the year multiplied by a more or less constant unit rate.

But while the original intrinsic value of the mineral deposit which existed from the beginning (in place, en bloc) is thus effectively recognized as the total fund capital to be returned through depletion allowances, on a basis of yearly allotment analogous to the accounting treatment for consumption of an ordinary stock of materials, this original intrinsic value has not yet been recognized by the regulations as invested capital for profits tax purposes. Under the regulations a corporation may not include the mineral property as invested capital at a greater sum than actual cost, if purchased for cash, or to a greater extent than the developed and ascertained value at the time of acquirement, if purchased for stock. It seems to us, however, that in these limitations upon invested capital the regulations do not interpret the statute reasonably; and that original intrinsic value of natural resources at the time of acquirement, whether actually known at the time or developed subsequently, is true paid-in surplus to the extent that original intrinsic value exceeds the nominal cost-value, and is admissible as invested capital under that sub-division.

Until this principle is accepted, however, there will remain constant discrepancies between cost-value of natural deposits (as invested capital) and intrinsic value of the same property (for depletion purposes), with the result of creating a question as to what constitutes "full recognition" of depletion from the time a corporation is organized down to the taxable year, as a charge against earned surplus and undivided profits claimed as a part of invested capital. Specifically the question is this: suppose the case of an investment in natural deposits acquired many years ago at a cost-value of $2,000,000 (invested capital) and suppose further an original intrinsic value of $50,000,000 which was not

fully established until later by new discoveries. Suppose further that one-half of the original intrinsic value has been removed by operations. In that event, is any diminution of the cost-value of $2,000,000 required by charge against profit and loss?

Obviously not, because depletion is calculated on the same principles as those applying to the consumption of a stock of materials; and until the last $2,000,000 of valuable content is removed there is no impairment of that purely nominal fund capital.

The $2,000,000 fund capital is an artificial creation, far removed from the reality of the intrinsic fund capital. Nevertheless, this artificial or nominal fund capital was the basis upon which the accounts were kept and was the basis upon which the profits were calculated which are now claimed as invested capital. It is the basis upon which the balance-sheet must be constructed, in order to verify the accumulated profits; for the natural deposit may not be taken in at a greater value than $2,000,000. The accumulated profits need not be diminished by depletion until the artificial and nominal fund capital is actually impaired by removal; and it is the last to be removed. Actual impairment of quantity and value is the basis of depletion. Therein it differs from depreciation, wherein the element of time is controlling.

In testing the earned surplus and undivided profits of a corporation from its organization down to the taxable year, in order to see that full recognition has been accorded throughout those years to the loss from depletion of natural resources, we do not see that any greater amount is called for than would be required by a court of law in any proceedings which involved stating the earnings of that period. The amount would be the ascertained impairment of the nominal fund capital, if impairment had taken place, and no more.

In conclusion, the true earned surplus and undivided profits of a corporation at a given date are the difference between the assets and unadjusted debits at that date, valued according to accepted accounting rules and excluding unearned increment, and the amount of the liabilities, unadjusted credits and nominal capital, similarly reckoned. So long as the statement conforms to accepted accounting practice, it need not be modified by rules

adopted specially for the administration of an income or profits tax measure. The revenue act of 1918, in allowing earned surplus and undivided profits as part of the invested capital of a corporation, does not qualify, limit or restrict the sense in which the terms earnings and profits are employed, and we must assume that they have their usual significance.

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EDITORIAL

Income Tax Inequities

Since the enactment of the first of the present series of income-tax laws in this country it has repeatedly been alleged in defence of the laws and their administration that we must not expect perfection at once, and that in the light of experience sharp edges would be worn off and rough places made plain.

It is now approximately six years since the enactment of a federal income-tax law in 1913, and it must be admitted that there has been a gratifying indication of a desire to improve both the form of the laws and the method of administering them. This is not to admit, however, that we have approached within hailing distance of perfection. Indeed, we are so far from it that few of us ever expect to realize our hopes.

There are one or two obvious injustices in the present system of laws which could be corrected without a great amount of amendment. If some of them were removed it would be greatly to the relief of the far too heavily burdened taxpayer.

It is well enough to pay heavy taxes during a time of war or in a period of reconstruction. We all expect to continue to pay taxes of an abnormally high character for some years to come, but we may justly feel that the government and congress should do everything in their power to place taxation upon as nearly fair a basis as can be discovered.

One of the glaring injustices of the present laws is the general classification of all increment as income. There are various sorts of increases in one's assets which may not be income in the true sense of the word.

For example, capital profits under the present laws are regarded in the same category as income from business or investment. This is not as it should be.

As an illustration, let us assume that A purchased in 1912 a piece of property for $10,000. In 1919 he received an offer of $50,000 for the property. Under the law, as it stands, A, if he sold the property, would be required to return $40,000 as income of the year 1919, when as a matter of fact the increment in value had been accruing from the date of purchase to the date of sale. In other words, A would be compelled to pay surtax at the highest rate ever called for in this country upon an increase in assets, only a portion of which had accrued during the period when such high taxes were in force.

Another illustration may be found in the case of the shareholders in corporations whose stocks are listed on public exchanges or otherwise the subject of sale. In 1912 stock in the Blank Steel Company may have been quoted at $40 a share. In 1919 it would be quite reasonable to expect such a company's shares to be selling in the neighborhood of $150. The shareholder might be anxious to sell his shares, but if he did so he would be obliged to return $110 a share as income of the year 1919, when in reality the advance in value had been in progress since the beginning of the war and had kept pace with the growth of demand for steel products.

We believe that accountants everywhere will agree that such profits as those mentioned in the foregoing illustrations should not be classified as income in the strict sense of the word—that is to say, income for the year of return. Perhaps the treasury would be ready to recommend an amendment of the law separating increases of capital value from ordinary income if the matter were properly presented to the department. With the experience which officers of the bureau of internal revenue have had it must be apparent to them that there is need for a revision of the laws so as to permit the bureau to differentiate between what might be called income of the year and capital profits.

Among earlier rulings of the department there were decisions which permitted profits of the kind mentioned to be prorated over the years from purchase to sale, but latterly there has been a

complete departure from this principle and all increment is regarded as pure income.

One of the most apparent and undesirable effects of the law in this particular was the recent bull market on stock exchanges throughout the country. It is generally admitted that while there has been justification for a considerable advance in quotations for stock of industrial companies, the advance has been out of proportion to the increase in intrinsic value of the shares. It is also recognized that one of the most potent factors in the advance has been the scarcity of stock. People who own shares of stock in the great industrials find themselves unwilling to take the profits which appear on paper because if they do so they will be compelled to pay surtax on an increase in value not entirely accruing during the year of return. The result is that enormous quantities of stock are held up by owners who would be glad to sell if they could do so without being compelled to part with practically all the profit. It may not be too much to say that if there had been some fair and easily computed tax on capital profits the number of shares available for investment would have been greatly increased and market prices would not have risen to a point at which many economists feel they are unsound.

It may not be stretching the point too far to attribute to the same cause part of the enormous increase in real estate values and the consequent increases in rentals. Persons who hold real estate upon which there is a paper profit of considerable magnitude cannot sell and realize any profit at all without adding enough to the already enhanced value to cover payment of income tax. To put it in another way, property values are now quoted at prices which will cover income tax up to the highest rate.

There have been various suggestions as to the manner in which taxation could be arranged to meet the necessities of the case. It has been proposed that there should be a pro-rated tax based upon the normal and surtaxes of each succeeding year and computed on the income returns of each individual or corporation concerned. This might be perfectly fair but it would probably require an entire college of actuaries to work out the computation, and when the result was reached no one would know whether it was right or wrong.

It seems to us that a fairer and more easily enforced law would be one which would separate annual profit from profit accruing over a series of years and providing that in the latter case a special rate, either low or high, as might be necessary, should apply, with the understanding, of course, that it should not be higher than an average of the taxes during the years from 1913 onward.

In the case of stocks the increment in price depends largely on the surplus. When a sale is made it would be fairer to impose a surtax based on the rates in force in the years when the surplus accrued. This would be in line with the 1917 law which so taxed dividends.

This is a matter which is of the utmost importance to all taxpayers, and therefore to accountants, and we bring it to the attention of our readers in the hope that some definite suggestions may be made which will appeal to the authorities in Washington.

Filing Tax Returns

It appears from recent rulings of the treasury department that there will be no general extension for the filing of income-tax returns except in the case of "absence or sickness." In such cases the rule which applied this year, namely, the payment of 25 per cent. of the estimated tax and presentation of a guess at the amount of taxable income on March 15th, will be followed, and the complete return may be filed within thirty days thereafter.

The experience of this year is likely to be duplicated in 1920. There may not be quite so much confusion in the compilation of returns nor such protracted delays in the issuance of forms, but the whole transaction is extremely complicated and there is no possibility whatever that all corporations in the country will be able to make their returns within the two and a half months provided by the law.

Last year extensions were not granted until the eleventh hour. Surely the treasury department could give attention to the matter now and thereby assist taxpayers to make their returns with proper care and without undue haste. The result would be to the benefit of the government, as well as to that of the taxpayer.

There is a further complication which will increase year by year. When the laws were first enacted taxpayers were inclined

to call upon lawyers, bankers and all sorts and conditions of men to make out their tax returns for them. It gradually became apparent, however, that the professional men most capable of handling the matter intelligently were the accountants, and the burden of tax preparation has been accumulating rapidly upon them. This year the amount of work was almost overwhelming, and in 1920 there is every reason to expect a further increase in the demand for accountants' services.

The profession is rendering a splendid service to the government and to the taxpayer, and it is only right to expect that the department charged with the administration of the law will co-operate to the utmost extent with the men upon whose shoulders chiefly falls the duty of tax return preparation.

The best solution of the difficulty is for the department to adopt last year's plans and accept tentative returns accompanied by twenty-five per cent. of the estimated amount shown. No detailed computation should be required. Thus the treasury will get its full twenty-five per cent. on time and six per cent. interest on the amounts by which income may be underestimated.

Income Tax Department

EDITED BY JOHN B. NIVEN

Perhaps the most important of the new rulings published in this number is the revision of articles 1566 and 1567 contained in T. D. 2924.

Where property is exchanged for stock it is made the uniform rule, in article 1566, that the transaction is a closed one and that there is always a profit or loss if the stock has a market value, this being deemed sounder law than the earlier rule by which, if the previous owner of the stock received 50% or more of the stock no gain or loss took place. Notwithstanding the reasons given for the revised ruling, we venture the opinion that its soundness may still be open to legal question.

Whatever the procedure adopted in uniting the properties of corporations, they and their stockholders fall, according to the new article 1567, within the rule that there is no taxable income if the consideration received is solely stock or securities of no greater par value than those surrendered. The term "reorganization" is made to cover all such corporate readjustments, if within the hands of the same interests to such a degree as to maintain the "affiliated" relationships defined in the act and requiring consolidated returns. How no-par-value stock figures in such comparisons is quickly settled if the controlling statute requires no minimum irreducible value to be set for it: its lack of denomination is accepted as giving it no "greater par or face value" than the surrendered issues. But if the laws require a minimum capital or amount of stock, the no-par-value stock is said to have a value representing "an aliquot part of such amount, proper account being taken of any preferred stock issued with a preference as to principal." Obviously the no-par-value common stock cannot always form "an aliquot part," an exact devisor, of the total stated capital or stock where the proportion of preferred stock to the total prevents the possibility of such ratio. Perhaps the term is misused, and "an integral part" or "a proportionate part" may be meant, but this point needs further clarification.

A ruling strained in its refinement is that (T. D. 2931) by which taxes payable for the taxable year 1918 are made deductible in computing invested capital on the dates when they would have been payable had the revenue act of 1918 been in force in 1918, with the modification that instalments that would have been due prior to February 25, 1919, are deemed payable on that date. Of course this rule does not apply to actual payments of additional taxes under the 1918 act imposed on corporations with fiscal years ending in 1918 which filed under the 1917 act. These additional taxes were payable in quarterly instalments beginning March 15, 1919.

The opinion concerning depreciation of intangibles expressed in the correspondence published in the last number of THE JOURNAL OF ACCOUNTANCY is now formulated in T. D. 2929 modifying article 163 of regulations

45. Intangibles acquired through capital outlay and having only a limited and calculable term of usefulness may be made the subject of a depreciation deduction.

Certain taxes that are not deductible are referred to in T. D. 2927 and 2937. Excise taxes paid to a state upon shares of stock owned by another corporation, the latter being the taxpayer, are not deductible by the latter, because paid for it, not by it. When taxes, or, more properly, assessments for local benefits, are for maintenance or repair, they can, if necessary to the conduct of business, be deducted as expenses, provided they are distinct from assessments for construction. The latter, as capital expenditures, are not deductible. The line between deductible and non-deductible taxes is determinable by whether or not they are levied for the general public welfare ratably on all property within the jurisdiction of the taxing body.

The new rule (article 443) regarding extensions of time by collectors is of first concern to accountants, in view of the approaching period for dealing with 1919 returns. It is only in cases of sickness or absence of essential officers that collectors are authorized to grant extensions, and then only for 30 days, requiring, in their discretion, tentative returns and payment of one-fourth of the tax. It may be taken from the opening sentence of the article, however, that, in other cases, if a genuine effort is made to file "as complete and final" a return as possible by the time set—and, of course, one-fourth of the tax being paid—taxpayers and their overburdened accountants may gain time for the elaborate accounting now required in the preparation of full returns.

T. D. 2922 contains the latest list of countries that do or do not reciprocate in allowing personal exemptions.

The other three decisions published are of minor importance and deal with matters of only occasional interest or of departmental routine.

TREASURY RULINGS

(T. D. 2920, September 15, 1919)

Providing for relief of domestic corporations which have assumed payment of income tax with respect to tax-free covenant bonds owned by nonresident aliens who are entitled to credits for personal exemption and dependents, but whose incomes from sources in the United States do not exceed such credits.

The final edition of regulations No. 45 is amended by inserting immediately after article 363, a paragraph which will be known as article 363a as follows:

ART. 363a. *Personal exemption of nonresident aliens.*—In case a nonresident alien is entitled to personal exemption and credits for dependents in accordance with paragraphs (c), (d), and (e), section 216 of the revenue act of 1918, and his gross income from sources in the United States, including bond interest, does not exceed his personal exemption and credits for dependents, a certificate, Form 1001B, should be executed and filed with the withholding agent, if any part of the gross income is derived from interest upon bonds of a domestic corporation which contain a tax-free covenant clause. The certificate may be filed with the withholding agent at the end of the calendar year but not later than February 1 of the succeeding year and all such certificates should be attached to the

annual list return, form 1013. The amount of tax due from the withholding agent, as shown by form 1013, may be reduced by two per cent. of the aggregate amount of interest payments made to the nonresident alien upon tax-free covenant bonds during the calendar year, and the amount of tax represented by the certificates, payment of which was assumed on monthly list return, form 1012, will not be included in the assessment against the withholding agent. The certificate may be filed only by a citizen or subject of the countries enumerated in paragraph (a) or (b) of article 307, as amended. In case tax in excess of a nonresident alien's tax liability has been withheld from interest upon bonds which do not contain a tax-free covenant clause, the nonresident alien should file or cause to be filed with the collector of internal revenue a return of his gross income from all sources within the United States, accompanied by a claim for refund on form 46.

(T. D. 2922, September 18, 1919)

Income tax.

Amending article 307, final edition of regulations 45, dealing with nonresident alien individuals entitled to personal exemption and credit for dependent.

The final edition of regulations 45 is amended by changing article 307 to read as follows:

ART. 307. ***When nonresident alien individual entitled to personal exemption.***—(*a*) The following is an incomplete list of countries which either impose no income tax or in imposing an income tax allow both a personal exemption and a credit for dependents which satisfy the similar credit requirement of the statute: Argentina, Belgium, Bohemia, Bolivia, Bosnia, Brazil, Bukowina, Canada, Carinthia, Carniola, China, Chile, Cuba, Dalmatia, Denmark, Ecuador, Egypt, France, Galicia, Goritz, Gradisoa, Herzegovina, Istria, Lower Austria, Mexico, Montenegro, Moravia, Morocco, Newfoundland, Nicaragua, Norway, Panama, Paraguay, Persia, Peru, Portugal, Roumania, Russia (including Poles owing allegiance to Russia), Salzburg, Santo Domingo, Serbia, Siam, Silesia, Styria, Spain, Trieste, Tyrol, Upper Austria, Union of South Africa, Venezuela. (*b*) The following is an incomplete list of countries which in imposing an income tax allow a personal exemption which satisfy the similar credit requirement of the statute, but do not allow a credit for dependents: Bachka, Banat of Temesvar, Croatia, Salvador, India, Italy, Slavonia, Slovakia, Transylvania. (*c*) The following is an incomplete list of countries which in imposing an income tax do not allow to citizens of the United States not residing in such country either a personal exemption or a credit for dependents and, therefore, fail entirely to satisfy the similar credit requirement of the statute: Australia, Costa Rica, Great Britain and Ireland, Japan, The Netherlands, New Zealand, Sweden. The former names of certain of those territories are here used for convenience, in spite of an actual or possible change in name or sovereignty. A nonresident alien individual who is a citizen or subject of any country in the first list is entitled for the purpose of the normal tax to such credit for a personal exemption and for dependents as his family status may warrant. If he is a citizen or subject of any country in the second list, he is entitled to a credit for personal exemption, but to none for dependents. If he is a citizen or subject of any country in the third list, he is not entitled to credit for either a personal exemption or for dependents. If he is a citizen or subject of a country which is in none of the lists, then to secure credit for either a personal exemption or for dependents he must prove to the satisfaction of the commissioner that his country does not impose an income tax, or that in imposing an income tax it grants the similar credit required by the statute.

(T. D. 2923, September 24, 1919)

Revised forms of ownership certificates.

Authorizing debtor corporations and withholding agents to accept old forms of ownership certificates with respect to interest due on and prior to November 1, 1919, when received from continental United States and with respect to interest due on and prior to December 1, 1919, when received from abroad.

(1) In view of the fact that the revised forms of ownership certificates were placed at the disposal of the public over three months ago, this office is of the opinion that a reasonable period of time has elapsed in which to permit the public to have become familiar with them. In order, however, to prevent inconvenience to individuals and organizations required to use such forms, old forms of ownership certificates will be accepted with respect to interest due on and prior to November 1, 1919, when received from continental United States, and with respect to interest due on and prior to December 1, 1919, when received from abroad.

(2) Banks and collecting agents, debtor corporations, and withholding agents shall refuse to accept the old forms, in connection with interest due, after the respective dates named herein, and collectors of internal revenue receiving monthly returns accompanied by certificates on the old forms, when it shall appear that such certificates were filed with debtor corporations or withholding agents, with respect to interest due subsequent to such dates, shall require the debtor corporation or withholding agent concerned to secure certificates on the revised forms.

(3) In order that the fulfillment of the requirements herein provided may cause as little hardship as possible to individuals, banks, collecting agents, debtor corporations, etc., collectors should satisfy themselves that they have a sufficient supply of the revised forms on hand to meet anticipated demands, and where the supply is not deemed sufficient, requisition should be made without delay for such additional quantity as may be necessary. Collectors are requested to disseminate this information throughout their districts as quickly as possible.

(T. D. 2924, September 26, 1919)

Income and excess-profits taxes.

Revenue act of 1918—Modification of articles 1566 and 1567 of regulations 45.

(1) Article 1566 of regulations 45, first authorized April 17, 1919, is considered as not being warranted in law, and is hereby modified to read:

ART. 1566. *Exchange of property and stock.*—Where property is transferred to a corporation in exchange for its stock, the exchange constitutes a closed transaction and the former owner of the property realizes a gain or loss if the stock has a market value, and such market value is greater or less than the cost or the fair market value as of March 1, 1913 (if acquired prior thereto), of the property given in exchange. For the rule applicable where a corporation, in connection with a reorganization, merger, or consolidation, exchanges property for stock, see article 1567.

(2) Article 1567 of regulations 45, as amended by T. D. 2870, is amended to read as follows:

ART. 1567. *Exchange of stock for other stock of no greater par value.*—In general, where two (or more) corporations unite their properties, by either (*a*) the dissolution of corporation B and the sale of its assets to corporation A, or (*b*) the sale of its property by B to A and the dissolution of B, or (*c*) the sale of the stock of B to A and the dissolution of B, or (*d*) the merger of B into A, or (*e*) the consolidation of the cor-

porations, no taxable income is received from the transaction by A or B or the stockholders of either, provided the sole consideration received by B and its stockholders in (*a*), (*b*), (*c*), and (*d*) is stock or securities of A, and by A and B and their stockholders in (*e*) is stock or securities of the consolidated corporation, in any case of no greater aggregate par or face value than the old stock and securities surrendered. The term "reorganization," as used in section 202 of the statute, includes cases of corporate readjustment where stockholders exchange their stock for the stock of a holding corporation, provided the holding corporation and the original corporation, in which it holds stock, are so closely related that the two corporations are affiliated as defined in section 240(b) of the statute and article 633, and are thus required to file consolidated returns. So-called "no-par-value stock" issued under a statute or statutes which require the corporation to fix in a certificate or on its books of account or otherwise an amount of capital or an amount of stock issued which may not be impaired by the distribution of dividends, will for the purpose of this section be deemed to have a par value representing an aliquot part of such amount, proper account being taken of any preferred stock issued with a preference as to principal. In the case (if any) in which no such amount of capital or issued stock is so required, "no-par-value stock" received in exchange will be regarded for purposes of this section as having in fact no par or face value, and consequently as having "no greater aggregate par or face value" than the stock or securities exchanged therefor.

(T. D. 2925, September 26, 1919)

Income and profits taxes.

Bonds under sections 214 (a) (12), 234 (a) (14), and 1320 of the revenue act of 1918.

Sections 214 (a) (12) and 234 (a) (14) of the revenue act of 1918 provide in part as follows:

At the time of filing return for the taxable year 1918 a taxpayer may file a claim in abatement based on the fact that he has sustained a substantial loss (whether or not actually realized by sale or other disposition) resulting from any material reduction (not due to temporary fluctuation) of the value of the inventory for such taxable year, or from the actual payment after the close of such taxable year of rebates in pursuance of contracts entered into during such year upon sales made during such year. In such case payment of the amount of the tax covered by such claim shall not be required until the claim is decided, but the taxpayer shall accompany his claim with a bond in double the amount of the tax covered by the claim, with sureties satisfactory to the commissioner, conditioned for the payment of any part of such tax found to be due, with interest.

Section 1320 of the same act provides, in part:

That wherever by the laws of the United States or regulations made pursuant thereto, any person is required to furnish any recognizance, stipulation, bond, guaranty, or undertaking, hereinafter called "penal bond," with surety or sureties, such person may, in lieu of such surety or sureties, deposit as security with the official having authority to approve such penal bond, United States Liberty bonds or other bonds of the United States in a sum equal at their par value to the amount of such penal bond required to be furnished, together with an agreement authorizing such official to collect or sell such bonds so deposited in case of any default in the performance of any of the conditions or stipulations of such penal bond. The acceptance of such United States bonds in lieu of surety or sureties required by law shall have the same force and effect as individual or corporate sureties, or certified cheques, bank drafts, post-office money orders, or cash, for the penalty or amount of such penal bond. The bonds deposited hereunder and such other United States bonds as may be sub-

stituted therefor from time to time as such security, may be deposited with the Treasurer * * * of the United States, * * * which shall issue receipt therefor, describing such bonds so deposited. As soon as security for the performance of such penal bond is no longer necessary, such bonds so deposited shall be returned to the depositor.

Article 268 of regulations No. 45 provides in part as follows relative to claims for losses in inventory and from rebates:

In the case of a claim in abatement filed with a return payment of the amount of the tax covered thereby shall not be required until the claim is decided, provided the taxpayer files therewith a bond on form 1124 in double the amount of the tax covered by the claim, conditioned for the payment of any part of such tax found to be due, with interest at the rate of 12 per cent. per annum. The bond shall be executed by a surety company holding a certificate of authority from the secretary of the treasury as an acceptable surety on federal bonds and shall be subject to the approval of the commissioner.

The bond executed on form 1124, pursuant to article 260 of regulations No. 45, together with the abatement claim, should be forwarded by the collector to the commissioner of internal revenue. When it is received by the commissioner, it will be detached from the abatement claim and forwarded to the surety bond section of the treasury department for certification as to the sufficiency of the sureties. The surety bond section will, after certification, return the bond to the commissioner for his approval. When he has approved the bond he will cause it to be attached to the abatement claim.

In case the claimant, in accordance with the provisions contained in section 1320 of the revenue act of 1918, elects to offer in lieu of the surety or sureties provided for on form 1124 United States Liberty bonds, or other bonds of the United States, as security, he should execute in duplicate a bond and agreement on form 1124a, prescribed below. The original should accompany the United States bonds offered as security; the duplicates should be forwarded by the collector with the abatement claim to the commissioner. If such bond and agreement is executed by a corporation, a duly certified copy of the resolution of the board of directors authorizing the execution should be attached. The United States Liberty bonds or other bonds of the United States offered as security shall at their par value be not less than the amount of the penal sum of the bond executed on form 1124a, which shall be in double the amount of the tax covered by the abatement claim. The bonds so offered as security must be delivered to the commissioner of internal revenue at the obligor's risk and expense. Coupon bonds can not safely be forwarded by registered mail unless insured by the obligor against risk of loss in transit. Registered bonds so offered as security must be registered in the name of the obligor and duly assigned to the commissioner of internal revenue at or before the date of deposit with the commissioner and need not be insured when forwarded by registered mail unless the obligor so elects. In connection with effecting insurance of bonds shipped, reference is made to article 187 (a) of regulations No. 2, revised.

The commissioner of internal revenue will issue a receipt in duplicate for United States bonds so deposited with him as security, the original of the receipt to be given to the obligor and the duplicate to be retained by the commissioner for his files. Upon receipt by the commissioner of the United States bonds so offered as security and upon satisfying himself as to their ownership and as to the sufficiency of the agreement for him to collect or sell, and in case of registered bonds as to the regularity of the assignments, he will approve the bond executed on form 1124a, and deposit the United States bonds offered as security with the treasurer of the United States, as provided in paragraph 7 of department circular No. 154 (1919), dated June 30, 1919, and the treasurer of the United States

will, as provided in said circular, give receipt therefor in duplicate, describing the bonds so deposited, the original to be delivered to the commission of internal revenue and the duplicate to be retained by the Treasurer for his files.

Bonds of the United States shall be returned to the obligor as soon as the security for the performance of such penal bond is no longer necessary. Registered bonds shall be reassigned to the owner when the liability is cancelled.

These special instructions are prescribed for the guidance of collectors of internal revenue pursuant to the provisions of treasury department circular No. 154 as to the acceptance of United States bonds in lieu of surety or sureties on penal bonds.

(T. D. 2927, September 30, 1919.)

Special excise tax on corporations—Decision of court.

DEDUCTIONS FROM GROSS INCOME—TAXES PAID ON BEHALF OF CORPORATION

Taxes paid to a state by various corporations upon shares of their stock owned by another corporation are not deductible from gross income of this latter corporation as taxes "paid by it," such taxes being not paid by this corporation, but being paid in its behalf by other corporations.

The appended decision of the United States district court for the district of Connecticut in the case of the *United States v. Aetna Life Insurance Co.* is published for the information of internal-revenue officers and others concerned.

UNITED STATES DISTRICT COURT, DISTRICT OF CONNECTICUT

United States, plaintiff, v. Aetna Life Insurance Co., defendant.

GARVIN, Judge: This action is submitted to the court for determination upon an agreed state of facts. It appears that the defendant, an insurance company incorporated under the laws of the state of Connecticut, was subject to pay annually during the years 1909, 1910, and 1911, with respect to the carrying on and doing of its business, the excise tax imposed by section 38 of the act of congress approved August 5, 1909, and was subject in all respects to the provisions of that section.

On or before March 1 in each of these years the defendant duly made its return to the collector of internal revenue in the proper district in the form prescribed by the commissioner of internal revenue as required by said section, which returns showed that the net income of the defendant for each of these three years exceeded $5,000.

On or about June 1 of the years 1910, 1911, and 1912 an excise tax under said act was duly assessed against the defendant for the years ending December 31, 1909, 1910, and 1911, respectively, said tax being 1 per cent. on the net income of the defendant. The tax was in each case paid as assessed.

When the defendant filed its return showing its net income for the year ending December 31, 1909, it deducted $479,625 as "taxes paid during the year ending December 31, 1909, imposed under authority of the United States or states and territories thereof." Of this sum it is conceded that $409,967.36 was lawfully deducted. It is claimed by the plaintiff that defendant should also have paid a tax of 1 per cent. on the remainder, $69,637.64, i. e., $696.56. Of the latter sum defendant admits liability to the extent of $227.62, leaving $468.96 in dispute. The amount admitted for 1910 is $343.17, $413.41 being in dispute. For 1911, $543.28 is admitted, $527.60 being in dispute. These sums in dispute represent taxes paid by various corporations upon shares of their stock owned by defendant, which taxes were imposed during the several years 1909, 1910, and 1911 by the state of Connecticut under chapter 54 of the public acts of 1905.

The deductions allowed a corporation by the act of August 5, 1909, include, "all sums paid by it within the year for taxes imposed under authority of the United States or of any state or territory thereof, or imposed by the government of any foreign country as a condition to carry on business therein." The taxes in question were not paid by the defendant, but in its behalf by other corporations.

While it is true that "a statute providing for the imposition of taxes is to be strictly construed, and all reasonable doubts in respect thereto resolved against the Government and in favor of the citizen" (*Mutual Benefit Life Insurance Co. v. Herold,* 198 Fed., 199, and cases therein cited), no doubtful meaning is here involved. The language of the act is clear and explicit. The allowable deductions in the case of a domestic corporation are plainly set forth.

Deductions allowed from gross income in the case of a domestic corporation:

Second. Such net income shall be ascertained by deducting from the gross amount of the income of such corporation, joint stock company or association, or insurance company, received within the year from all sources.

(First) all the ordinary and necessary expenses actually paid within the year out of income in the maintenance and operation of its business and properties, including all charges such as rental or franchise payments, required to be made as a condition to the continued use or possession of property;

(Second) all losses actually sustained within the year and not compensated by insurance or otherwise, including a reasonable allowance for depreciation of property, if any, and in the case of insurance companies the sums other than dividends, paid within the year on policy and annuity contracts and the net addition, if any, required by law to be made within the year to reserve funds;

(Third) interest actually paid within the year on its bonded or other indebtedness not exceeding the paid-up capital stock of such corporation, joint stock company or association, or insurance company, outstanding at the close of the year, and in the case of a bank, banking association or trust company, all interest actually paid by it within the year on deposits.

(Fourth) all sums paid by it within the year for taxes imposed under the authority of the United States or of any state or territory thereof, or imposed by the government of any foreign country as a condition to carry on business therein;

(Fifth) all amounts received by it within the year as dividends upon stock of other corporations, joint stock companies or associations, or insurance companies, subject to the tax hereby imposed.

If it had been the intention to permit such a deduction as defendant urges, the act would have provided that there be included "all sums paid by it or in its behalf within the year."

Defendant relies upon a decision by the treasury department rendered March 24, 1916, reading in part:

You are advised that when a corporation pays taxes for its stockholders, such payments represent a portion of the earnings of the corporation, which instead of being distributed to the stockholders in the form of dividends is used in payment of taxes which the stockholders individually owe. Should you instead of paying the taxes, pay over this sum to the stockholders, the stockholders would be required to return the amount as income received, and would then be entitled to deduct the same under the item of taxes paid during the year. Under the excise tax law a stockholder which is a corporation is entitled to deduct from gross income all dividends received from another corporation subject to tax, and therefore is entitled to deduct as a dividend that portion of the earnings of the corporation in which it owns stock, which is represented by the stock-

holder's tax. For the years 1909 to 1912, inclusive, therefore, the corporation which is a stockholder will be entitled to an additional deduction on account of the taxes paid for it by the corporation issuing the stock, for the reason that it produces the same result as if the corporation owning the stock was required to return as income for these years the full amount of the dividend, including that portion of the dividend diverted to pay tax, and then took credit as a deduction for this entire amount under the item of dividends received from other corporations, and also took credit for the amount of taxes paid under that item. Under the income-tax law, however, a corporation is not entitled to deduct from gross income dividends received from other corporations. Consequently if it claims the benefit of deducting from gross income taxes paid for it by another corporation it must include such amount in income as the deduction counterbalances the receipt. As you, the stockholder in this case, did not return as income the amount in question, you are not entitled under the income-tax law to deduct the same. The claim on account of the tax assessed for the year 1913 is accordingly rejected, and you will find inclosed notice of demand for payment of this tax.

The claim for the abatement of the additional tax assessed for 1912 has received favorable consideration for the reason above stated.

This decision points out that a corporation making a claim such as is advanced by defendant must have included in its return as income the taxes which were paid in its behalf by other corporations. No such return was made by defendant herein, therefore the decision is not in point even if it were controlling on the court.

There was no refusal or neglect to make a return within the meaning of the act and therefore no penalty will be allowed.

Judgment for plaintiff for $2,524.04, with interest from June 9, 1915.

(T. D. 2929, October 7, 1919.)

Income and excess-profits taxes.

Depreciation of intangible property—Modification of article 163, regulations No. 45.

Article 163, regulations No. 45, is modified to read as follows by eliminating therefrom the last sentence, reading, "there can be no such allowance in respect of good will, trade names, trade-marks, trade brands, secret formulas, or processes":

ART. 163. *Depreciation of intangible property.*—Intangibles, the use of which in the trade or business is definitely limited in duration, may be the subject of a depreciation allowance. Examples are patents and copyrights, licenses and franchises. Intangibles, the use of which in the business or trade is not so limited, will not usually be a proper subject of such an allowance. If, however, an intangible asset acquired through capital outlay is known from experience to be of value in the business for only a limited period, the length of which can be estimated from experience with reasonable certainty, such intangible asset may be the subject of a depreciation allowance, provided the facts are fully shown in the return or prior thereto to the satisfaction of the commissioner.

(T. D. 2931, October 7, 1919.)

Excess-profits tax.

Amendment of article 845, regulations 45.

The final edition of regulations 45 is amended by inserting immediately after article 845 a paragraph to be known as article 845(a), as follows:

ART. 845(a). *Surplus and undivided profits; reserve for* 1918 *income and excess-profits taxes of corporations having a fiscal year.*—In the case of corporations having a fiscal year, the federal income and profits taxes

for the taxable year 1918 shall, for the purpose of computing invested capital for the taxable year 1919 be deemed to become due and payable as follows: (*a*) As to such amounts as became due and payable prior to February 25, 1919, under the provisions of section 14(a), revenue act of 1916, such law shall govern; (*b*) in all other respects the provisions of section 250 of the revenue act of 1918 shall govern except that the instalments which would become due prior to February 25, 1919, shall be deemed to become due and payable on that date; (*c*) any amounts which became due and payable under said section 14(a) prior to February 25 shall, so far as possible, be deemed to cancel the earlier instalments payable under said section 250. For example, a corporation whose fiscal year ended August 31, 1918, is assessed a total income and profits tax under the 1917 law of $250,000 and an additional tax under the 1918 law of $110,000. The total tax of $360,000 would, for the purpose of computing invested capital, be deemed to become due and payable as follows: February 15, 1919, $250,000; May 15, 1919, $20,000; August 15, 1919, $90,000. If, assuming the same taxes, the fiscal year ended September 30, 1918, the total tax would, for the purpose of computing invested capital, be deemed to become due and payable as follows: February 25, 1919, $90,000; March 15, 1919, $90,000; June 15, 1919, $90,000; September 15, 1919, $90,000. The provisions of this article apply solely for the purpose of computing invested capital and do not affect the provisions of T. D. 2797 in regard to the time and manner of paying taxes where corporations have filed returns for fiscal years ending in 1918.

(T. D. 2935, October 16, 1919.)

Income tax.

Failure to file final returns where tentative returns have been filed—Article 443 of regulations amended.

Section 1309 of the revenue act of 1918 (approved Feb. 24, 1919) provides in part as follows:

That the commissioner, with the approval of the secretary, is hereby authorized to make all needful rules and regulations for the enforcement of the provisions of this act.

In pursuance of the foregoing provision of law, article 443 of regulations 45 is hereby amended to read as follows:

ART. 443. *Extension of time by collector.*—It is important that the taxpayer render before the return due date a return as complete and final as it is possible for him to prepare. However, in cases of sickness or absence collectors are authorized to grant an extension of not exceeding 30 days where, in their judgment, such further time is actually required for the making of an accurate return. (See article 1002.) The application for such extension must be made prior to the expiration of the period for which the extension is desired. The absence or sickness of one or more officers of a corporation at the time the return is required to be filed will not be accepted as a reasonable cause for failure to file the return within the prescribed time unless it is satisfactorily shown that there were no other principal officers available and sufficiently informed as to the affairs of the corporation to make and verify the return. As a condition of granting an extension of time for filing a return, the collector may require the submission of a tentative return and estimate of the tax on form 1040-T in the case of individuals, or on form 1031-T in the case of corporations, and the payment of one-fourth of the estimated amount of tax. Where a taxpayer has filed a tentative return and has failed to file a complete return within the period of the extension requested by him, the complete return when filed is subject to penalties prescribed for delinquency. Where a tentative return has been filed and no time has been fixed within which a complete return must be filed, the collector may at

any time send notice to the taxpayer to file a complete return within a period of time therein specified by him, and a taxpayer who fails to comply with such request will incur the penalties prescribed by statute for delinquency in filing a return.

(T. D. 2937, October 16, 1919)

Income tax—Assessments for drainage.

Article 133 of regulations 45 is hereby amended to read as follows:

ART. 133. *Taxes for local benefits.*—So-called taxes, more properly assessments, paid for local benefits, such as street, sidewalk, and other like improvements, imposed because of and measured by some benefit inuring directly to the property against which the assessment is levied, do not constitute an allowable deduction from gross income. A tax is considered assessed against local benefits when the property subject to the tax is limited to the property benefited. Special assessments are not deductible, even though an incidental benefit may inure to the public welfare. The taxes deductible are those levied for the general public welfare by the proper taxing authorities at a like rate against all property in the territory over which such authorities have jurisdiction. Assessments under the statutes of California relating to irrigation and of Iowa relating to drainage, and under certain statutes of Tennessee relating to levees, are limited to property benefited, and when it is clear that the assessments are so limited, the amounts paid thereunder are not deductible as taxes. When assessments are made for the purpose of maintenance or repair of local benefits, the taxpayer may deduct the assessments paid as an expense incurred in business, if the payment of such assessments is necessary to the conduct of his business. When the assessments are made for the purpose of constructing local benefits, the payments by the taxpayer are in the nature of capital expenditures and are not deductible. Where assessments are made for the purpose of both construction and maintenance or repairs, the burden is on the taxpayer to show the allocation of the amounts assessed to the different purposes. If the allocation can not be made, none of the amounts so paid is deductible.

Haskins & Sells announce the opening of an office in Shanghai, China, on or about March 1, 1920, under the management of Henry S. DeVault.

Hood & Strong announce the removal of their offices to the Newhall building, 260 California Street, San Francisco.

MacHugh & Garretson announce the removal of their offices to the Vulcan building, 277 Pine street, San Francisco.

Loomis, Suffern & Fernald announce that J. S. M. Goodloe has become a member of the firm.

J. Pryse Goodwin announces the opening of an office at 25 Church street, New York.

Schindler & Naren announce the opening of offices at 1211 Chestnut street, Philadelphia.

Students' Department

EDITED BY SEYMOUR WALTON
(ASSISTED BY H. A. FINNEY)

STOCK WITH NO PAR VALUE

There are four expressions used in regard to the capital stock of a corporation with reference to its value per share:

(a) Face value, which is the amount shown on the face of the stock certificate. This is also called the par value of the stock. It is usually $100.00 a share, but may be any amount from one dollar up to one thousand dollars.

(b) Book value, or the value which is shown by the books. In ascertaining this value all the items on the balance-sheet are taken at their worth as they are listed. As the company belongs to the owners of the capital stock, the value of the total stock is manifestly the excess of the assets over the liabilities—in other words the net worth of the business. Since this excess is represented by the amount of the capital stock plus the accumulated profits, or surplus, the book value of each share is found by dividing the sum of the capital stock and surplus by the number of shares outstanding. If the company has made net losses instead of profits, the number of shares must be divided into the amount of the capital stock minus the deficit. The book value of each share is the amount the stockholders would receive for each share held by them if the assets could be realized at the values shown on the balance-sheet and if there were no more liabilities than were therein expressed.

(c) Real value. As the book value is ascertained from the balance-sheet, the real value is determined by a statement of affairs in which the assets are valued at the amounts which they may be expected to realize, without any regard to the values placed on them on the books. If the net free assets are in excess of the total unsecured liabilities, the amount of this excess divided by the number of shares will express the real value of each share. Of course, it must be remembered that the term "real" is relative only, being based on the opinion of those best calculated to judge the actual value of the assets. The true real value can be ascertained only by liquidating the company so that the net worth will be represented by actual cash.

(d) Market value is that for which the stock will sell. This may be different from any of the other values. While it is based primarily on the estimate of investors as to its real value, it is largely affected by the earning capacity of the company. If the business of a company is prosperous and is likely to continue to be so, an investor will often pay much more than the real value for its shares on account of the large returns he expects to receive on his investment in the form of dividends. On the

other hand if a company is making little or no profits, the market value of the stock is likely to be low, although its assets may be undoubtedly good, because an investor does not care to buy stock which will not yield him an income.

In the last analysis of the matter a share of stock represents an undivided interest in the net worth of the company proportionate to the number of shares issued. The true value is not necessarily represented by the number of dollars which appear on the stock certificate. In fact the value on the face of the certificate is seldom any criterion of the true value. So accustomed have people become, however, to considering that a stock certificate calling for ten shares of stock of one hundred dollars each really represents one thousand dollars, that it is difficult for them to realize that such a certificate in a company whose total capital stock is one hundred thousand dollars really represents an undivided one per cent. of the net worth of the company, whatever that may be.

A number of years ago, John Grant Dater, speaking of the report of the Railways Securities Commission, said:

"Most of the evils of which investors and the public complain, according to the commission, have grown out of the attempt to give to stock a face value in terms of money. That is, because a certificate bears on its face words or characters representing one hundred dollars, people persist in regarding it as the equivalent of such a value, whereas the true value may be something wholly different, and may range far above or far below the indicated figures.

"The commission would remove the dollar mark entirely from the face of a share of stock, making these certificates of interest in the property. Such certificates, it points out, would represent the true value of a property at all times more nearly than under the present system.

"To illustrate: why should a property of problematical worth be capitalized, let us say, at twenty-five million dollars, represented by two hundred and fifty thousand shares of one hundred dollars par, with the shares selling in the market at ten dollars, or some such price? The figures on the face are not representative of true value. Would it not be better to issue against such property two hundred and fifty thousand certificates of interest which would fetch their worth in the market at all times?

"Nominal figures of capitalization do not make a property worth more or less, but excessive nominal capitalization, when it is mistaken or confused with true value, works a deception upon investors and the public. It leads to the charge, when the railways want to raise rates, that they are doing so to maintain dividends on watered stocks. It has also proved a real detriment to many corporations in attempting to secure needed funds for development."

Undoubtedly the original idea in forming a corporation was that the capitalization should represent actual value. It is pertinent to inquire why there was not adherance to that idea. The first deviation from it was including among the assets fictitious values ascribed to such things as patents, franchises or goodwill, although on the face of it this was not a deviation since the capital purported to represent value of some kind, and a certificate of interest would not differ in value from a certificate for shares of stock. The practice that causes the most mischief is that of issuing stock at a discount, whether it is original stock or treasury stock. It would seem that if it were desired to raise $200,000 with which to

develop a mine the logical procedure would be to issue 200,000 shares at one dollar each and to sell them at par. Why does the company think it necessary to issue two million shares of a par of one dollar and to sell them at prices ranging perhaps from five cents to twenty-five cents each?

One reason is found in the universal love for a bargain. This is generally considered to be a characteristic of members of the gentler sex, but it is by no means confined to them. To many men as well as women the temptation to acquire one thousand dollars of stock for fifty or one hundred dollars is irresistible. Although many of them really know better, they cannot rid themselves of the idea that a nicely engraved certificate calling for one thousand dollars is actually one thousand dollars. Therefore vastly greater amounts of money can be realized from the sale of bargain stock than could be obtained by selling the stock on the basis of par.

Arthur Train makes Mr. Tutt say "There are two things that women seem to like better than anything else in the world—babies and stock certificates." He could easily have added a third—bargains, and could have stated that when a stock certificate and a bargain are combined in one the attraction is irresistible, and he need not have confined the remark to women.

Another reason for the practice is the ease with which a substantial increase can be made in the price at which stock is being sold by the promoters by what is apparently a trivial increase in the quotation. On stock with a par of one dollar, five cents is only five per cent., and five per cent. is a very small proportion to add to the price of the stock. But if the stock has been selling at ten cents a share an addition of five cents is really an increase of fifty per cent. The shrewd promoter takes advantage of this difference to urge immediate purchase when the stock is selling at ten cents by stating that the price is soon to be advanced fifty per cent., but when the stock has been advanced he consoles a new customer by calling the advance only five per cent.

Still another reason is that it is far easier to sell stock at a discount than at a premium when the time comes to unload the promotion stock. That is, when the project has become a sufficient success apparently to justify the belief that it will be a permanently paying proposition, it is easier to sell the stock which has been issued on the basis of ten cents at 75 per cent. of its face than it would be to dispose of full paid stock at 750 per cent. Yet in actual money it amounts to the same thing. If the capitalization has been for two million shares at a par of one dollar and the promoter has donated half of it to be sold at ten cents a share, he can offer his own stock when the time comes at the bargain price of seventy-five cents a share. If the company had been capitalized with two hundred thousand shares, none to be sold at less than par, he would be obliged to ask seven dollars and fifty cents a share to realize the same amount. Where it might be easy to sell one thousand shares for seven hundred and fifty dollars, it would be difficult to sell one hundred shares for the

same seven hundred and fifty dollars. It is useless to say that the purchaser gets the same value for the same money in each case; there is a fascination about one transaction that the other does not possess.

Any one who has had any experience with promoters, especially those who are exploiting gold or other mines, knows that this is a correct statement of the case. Even persons who are considered hard-headed business men yield to the fascination of acquiring something for a little better than nothing. The list of stockholders in any shrewdly promoted company will contain the names of many who would not ordinarily be classed as "suckers."

It is not intended to imply that all persons who are engaged in selling mining or other promotion stocks at heavy discounts are intentionally deceiving their customers. On the contrary, they are more often than not men who fully believe in the great possibilities that they claim their propositions contain.

It is impossible to tell how much money is lost by subscribers to stock in companies which never get beyond the stock-selling stage, but a low estimate puts it at more than one hundred million dollars a year in the United States. Many of these companies are pure and simple fakes, but many of them are founded on facts plausible enough to prevent the sale of their stock from being interfered with by blue-sky laws or the regulations of the post-office.

The best protection for the ignorant purchaser of such stocks is to be found in some method that will force him to investigate the value of what he is buying. The plan recommended by the Railways Securities Commission is a long step in that direction. A man who is offered one thousand dollars of stock in a two million dollar mining company for one hundred dollars may think that he is getting a great bargain. He would not be so likely to purchase if he were offered a certificate of interest calling for one-twentieth of one per cent. of the assets and prospects of the company. He would then be more particular to inquire as to the value of the assets and prospects, for he would realize how small a portion of them he was actually obtaining.

To meet the situation a number of the states have passed laws authorizing the issue of stock with no par value, which is virtually the same as the certificates of interest recommended by the Railways Securities Commission. The number of shares is fixed, but the amount that must be paid on each share is left to the discretion of the organizers and directors of the company, except that it must not be less than a minimum, which is usually five dollars. The certificate of stock states the number of shares represented by it, but does not express any value per share. The result is that the corporation closely resembles a partnership whose members share profits in the proportion of their investments, either original or since acquired.

There are several interesting questions that arise in discussing stock of this character. Naturally the first is as to the value of the stock. In order to ascertain the value per share it is imperative that the number of

shares outstanding shall be expressed on the balance-sheet. Even the most ignorant stockholder must realize that he owns that portion of the enterprise that is represented by a fraction of which the number of shares he holds is the numerator and the total number of shares outstanding is the denominator. His proportionate interest being thus determined, he is inevitably led to inquire as to what constitutes the property of which he owns an undivided fraction. Even if he realizes that this property is the net worth of the business represented by the paid-in capital and the subsequently acquired profits, he will get a good idea of the real value of his stock. The assets may be overvalued, but there is no reason for including among them purely fictitious items like patents, franchises and goodwill, which are necessary in the fixed capital companies in order to make the net assets balance the capitalization. The fictitious items not having been paid in could not get on the books, because the capital stock is issued only for the amount of cash or other assets contributed.

However, this would not prevent the giving of stock to a promoter for services valued at the proper amount to represent the stock. That is, if the stock is being issued at sixty dollars a share, the promoter may value his services at sixty thousand dollars and be given one thousand shares to represent them. A scrutiny of the assets would still be necessary, but that scrutiny is much more apt to be given when the stockholder realizes that he owns an undivided fractional interest in the assets rather than a specified number of dollars.

In the balance-sheet the capital stock would show at the amount that had been paid in. Thus if a company is organized with an authorized capital of 5,000 shares of which 3,000 had been paid for at the agreed price of $60.00 each, the balance-sheet would read

Capital stock 3,000 shares		180,000.00

It could not be shown as it might be in a fixed capital company

Capital stock	300,000.00	
Less unsubscribed	120,000.00	
		180,000.00

because the unsubscribed 2,000 shares have no par value and may finally be subscribed for on a basis entirely different from $60.00.

However, if 3,000 shares had been subscribed for and they had not all been paid up, the statement could be

Capital stock, 3,000 shares	180,000.00	
Less unpaid	45,000.00	
		135,000.00

leaving it in doubt whether $45.00 had been paid on each of the 3,000 shares, or 2,250 shares had been paid in full and 750 shares had paid nothing, or all had paid something and some had paid in full. If it were desired to show the exact condition, it would be necessary to say:

Capital stock 3,000 shares, viz.:		
1800 shares in full	108,000.00	
1200 shares not paid in full	27,000.00	
		135,000.00

The next question that arises concerns the treatment of profits when they are made. If the company with 3,000 shares at $60.00 should make $15,000.00, either of two dispositions of the surplus is possible. It may be credited to capital or to surplus. If credited to surplus it may afterwards be used in payment of dividends if so desired. If credited to capital the entry would be legitimate because there being no fixed par value, it is not necessary to keep the capital stock account at any fixed figure. However, the crediting of the profits to capital would probably act in the same way as does a stock dividend in the ordinary company and would change surplus available for dividends into fixed capital. Probably, if profits accumulated, part of them would be transferred to capital and the remainder left in surplus as an "anchor to windward" to be used in case of emergencies. One point to be noticed is that the additions to capital are not limited to what is necessary to bring the stock to a value of $100.00 a share. Since there is no fixed par, the stock may be made to be worth any amount.

If it were decided to issue and sell some of the unsubscribed stock after the company had accumulated a surplus, the total amount received would be credited to capital if the previous accumulations had been added to capital account. Otherwise, the credit to capital would be for the same amount per share that the original stock was sold for and the rest of the payment would be credited to surplus. That is, if the original stock consisted of 3,000 shares at $60.00 and there were $30,000.00 in undivided profits on hand, the stock would be worth $70.00 a share. If 1,000 shares of the unsubscribed stock is now sold at $75.00 a share the entry will be:

Cash	75,000.00	
Capital stock		60,000.00
Surplus		15,000.00
For 1,000 shares sold at $75.00		

The capital stock account will now have a credit balance of $240,000.00 and surplus $45,000.00, a total of $285,000.00 for 4,000 shares, making the value per share $71.25. The 3,000 shares of old stock have received the benefit of only $3,750.00 of the $5,000.00 bonus paid by the new stockholders who themselves receive the benefit of the other $1,250.00 in their share of the surplus.

It might be claimed by the old stockholders that all the bonus belonged to them because they had developed the business that made it possible to exact the bonus or premium. This could be given to them by an entry made prior to putting the sale of the new stock on the books, but it would have no effect, unless a dividend of $5,000.00 were declared and paid or at least credited to "dividends payable" while there were still only 3,000 shares outstanding. If the $5,000.00 were merely credited to surplus, the following would be the entries:

Bonus from new stock	5,000.00	
Surplus		5,000.00

and when the new stock was sold:

Cash	75,000.00	
Capital stock		60,000.00
Surplus		10,000.00
Bonus		5,000.00

The surplus would be as before, $45,000.00, and the old stockholders would have received the benefit of only $3,750.00 out of the $5,000.00 bonus. It is important that the disposition of the bonus be specifically determined when the sale is made. If nothing is said about it the bonus will undoubtedly belong to the company itself and be shared by the new stockholders.

Thus far we have considered the case of a company having only one class of stock. The situation becomes more complicated when there is preferred as well as common stock. From the nature of preferred stock it naturally follows that it should have a fixed par value. The holders of such stock are entitled to an agreed amount per share in cash as income. When the stock is cumulative preferred the payment may be deferred, but it must be made eventually if the business succeeds. Without the consent of the holders the directors cannot substitute a stock dividend for one payable in cash; therefore if there be no fixed par to the preferred stock, no profits can be added to the face value. There might be one possible exception to this in case the preferred participated equally with the common in any dividends beyond that guaranteed to the preferred. If such a distribution of excess profits were made to the common in the form of an addition to the face value of the common stock, the directors might claim the right to make the same disposition of the excess allotted to the preferred. Even in this case the dividend could be made by issuing additional shares of preferred stock instead of adding to the face value of the preferred stock already issued.

When a company has cumulative preferred stock the right to the surplus no longer resides wholly in the common stock. Even if the preferred dividends are paid up in full to date, it may be unwise to give the common stock all the surplus, either in cash or as a credit to the face value, because the profits of the next succeeding period may not be sufficient to pay the preferred dividend for that time. This is on the theory that profits having once been credited to capital stock have become fixed capital which cannot be reduced by the vote of the directors alone.

If a company with 6% cumulative preferred stock of 5,000 shares at a fixed par of $100.00 and common stock with 5,000 shares of no fixed par issued at $60.00, had an accumulated surplus of $90,000.00, the situation would be

6% cumulative preferred stock 5,000 shares	500,000.00
Common stock, 5,000 shares	300,000.00
Surplus	90,000.00

If the dividend on the preferred for the last six months had not been paid it would be incorrect to say that the book value of the common stock was $390,000.00, because the preferred stock has a claim on the surplus for a 3 per cent dividend, or $15,000.00. If the directors now declared dividends of 3 per cent to the preferred and 5 per cent to the common, the situation would be

6% cumulative preferred stock	500,000.00
Common stock, 5,000 shares	300,000.00
Preferred dividend payable	15,000.00
Common dividend payable	15,000.00
Surplus	60,000.00

The directors would have the right to change the surplus into fixed capital by crediting all the $60,000.00 to the common capital stock account, bringing the common stock to $360,000.00 or $72.00 a share. If they did this, they would run the risk of not being able to meet the next semi-annual dividend on the preferred, not to mention the danger of having an actual deficit, in case of a bad fire or other unforeseen loss. It would be wiser to retain at least a large portion of the profits in surplus, which is to a certain extent under the control of the directors. However, this is financial rather than accounting advice.

This is not the same as the usual advice not to dissipate all the profits in dividends, because the profits are still retained whether they are added to the capital or are left in surplus. It is merely a question as to whether or not the profits shall be fixed as capital or left in surplus where they are available for future dividends. If the advice of the accountant is asked he should favor the carrying of a considerable portion of the profits in a substantial surplus.

RESERVE FOR FREIGHT TO BE PAID

Editor, Students' Department:

SIR: I would like to ask your assistance in regard to one of the accounts on the books of our company, the details of which are as follows:

More than a year ago, we shipped a large number of carloads to England, the freight on which was to be prepaid. It is customary to pay the ocean freight on prepaid shipments at the time the goods are loaded on the steamer. When we closed our books last January, there were still thirteen cars at the seaboard awaiting transshipment.

On account of the abnormal conditions, the ocean rates were very high, and the freight on these thirteen cars amounted to something like $19,075.00. In view of the amount being so large, I decided that it should be taken into consideration when determining our net profit for the year, and therefore created a "reserve for prepaid ocean freight" account, charging off the amount.

Subsequently, however, only four carloads were forwarded, the freight on which amounted to approximately $6,000.00, and owing to the fact that the government requisitioned practically the entire steamer space, the transportation company found it impossible to ship the remaining nine cars. We were therefore compelled to have these returned to Cleveland, and as a result our reserve account still shows a credit balance of $13,000.

Will you kindly advise me whether I handled this item correctly, and also as to the method of closing the reserve account. This was the first

time I opened a reserve account on our books, and I have been greatly puzzled as to just what should be done with this balance.

Would this be considered a profit on this year's business? What effect would it have on our excess profits tax?

Cleveland, Ohio. H. C. K.

Owing to the lack of complete information in regard to the shipment, it is necessary to assume three possible conditions:

1. The goods were consigned.
2. The goods were sold c.i.f. at a fixed price which has been charged to the customer and credited to sales.
3. The goods were sold, but no entries had been made for the sale, or, if any had been made, they were merely pro forma and included only the cost of the goods and freight to the port of shipment.

1. If the goods were consigned, no notice should have been taken of the ocean freight until it was paid, and then it should have been added to the cost of the goods in the consignment account. However, if the credit were made to a reserve account the offsetting debit would be to the cost of the consignment, and not to an expense account of freight. The correcting entry for the goods not shipped would be a debit to the reserve and a credit to consignment account. As no profit had so far been taken, there would be no loss to be taken up, except the railroad freight on the unsold goods.

2. In this case, the amount charged the customer and credited to sales would have included the cost of the goods, all freight and the profit on the deal. If the books were closed with these entries unchanged, it was necessary to charge the expense account of freight and credit the reserve, since the freight was included in the credit to sales and therefore to profits.

If the tax return were made on the basis of sales which included the carloads not finally shipped, the profits on which tax was paid were overstated to the extent of the profit that would have been made on the goods not finally shipped. It would probably be difficult to collect a rebate of taxes by claiming an error in the sales. The reversing entries in the current year will offset the overpayment, if the profits are large enough to stand the deduction.

In the abnormal uncertainty prevailing in regard to shipping conditions, it would have been an error to enter this sale as a completed transaction. Delivery is an essential feature of a sale and until delivery is reasonably certain no sale has been made, unless the goods were sold f.o.b. Cleveland, the customer then accepting delivery in Cleveland. The conditions show that this was not the case.

If the entries for the sale had been made, they should have been reversed before the books were closed, the goods being taken back into inventory at cost.

3. If no entries had been made, or only those which covered the cost, no profit would have been taken, and the correcting entries would involve no loss. The conditions would be the same as in the case of the consignment of the goods.

In any event the charge-off of the reserve this year would not be a profit. The only profit involved would be in case (2), and that profit was recorded last year. The reversing entries would represent a loss, or rather a correction of last year's surplus. As the credit of the freight to reserve last year reduced the apparent profit on the sale, the charge back to reserve this year will reduce the apparent loss on the return of the goods.

FREIGHT ON RETURNED CONSIGNMENTS

Editor, Students' Department:

SIR: Recently in closing a consignment account we found it necessary to have a quantity of goods returned, and these goods when received were placed in our finished stock.

Some of our accounting force hold the opinion that the freight on the return of these goods should be added to the cost of the article and used, when the goods were re-shipped, as part of the cost of manufacture.

There is some difference of opinion as to the handling of this item, and in order to settle the matter so that everyone will feel that his ideas were given due consideration, I would ask that you kindly give me your views of the disposition of the item. Yours very truly,

L. F. B.

In handling consignments-out the goods should be charged at cost to the consignee in an account in which its character is specifically designated as a consignment and not as a regular sale. To the cost at the factory may be added the freight to the consignee, on the ground that the goods are worth what it cost to get them into the hands of the consignee or they would not have been sent to him.

When the goods are returned to the factory by the consignee, the only argument in favor of their being charged back at cost plus freight out and back again would be that the goods have been increased in value by the two journeys. If those of the accounting force who hold that both freights should be added to the cost value are able to prove in what way the goods have been benefited, instead of being injured, by their travels, their contention may be accepted. Otherwise, they must be taken back into finished stock at their cost, at best, and both freights must be charged off as expense.

The same reasoning would apply to goods returned on a regular sale. Surely no one would think of charging them back to stock plus any freight.

What is called in logic the "reductio ad absurdum" is often helpful. Suppose the same goods were sent out and returned several times, and the freights were added each time, the value might become so great that they could never be sold at a profit. If this treatment is absurd as applied to several shipments, it is only a degree less so when applied to one.

FIRE LOSS

Editor, Students' Department:

SIR: Will you kindly give me your opinion on the following questions in regard to recording transactions of complete loss by fire.

It is desired by the firm to show the total amount, at a glance, of the salvage and insurance received.

Is it correct to enter through the voucher register, and charge total column to accounts receivable, all sales of parts of buildings, machinery, materials, etc., purchased and entered originally in the voucher register, the credit being to salvage account?

Should supplies purchased to be used in making salable the materials and machinery saved from fire and wages incurred for them, be debited to salvage account?

In closing the accounts, should the balance of buildings, plant and machinery and inventories accounts be debited to salvage account and the balance of salvage account be debited to surplus account?

In making out the profit and loss statement for the part of fiscal year when the plant was operated, should an approximate percentage of inventory on hand at time of fire, be taken to find the cost of goods consumed?

Very truly yours,

A STUDENT.

The proper procedure in handling a total fire loss is to open a fire loss account. This account is charged with the net book value of the buildings and machinery. To put the net value on the books, the reserves for depreciation must be transferred by journal entry to the credit of the fixed asset accounts.

The materials inventories must be approximated by the gross profit method, unless an adequate cost system is in use, in which case the book inventories should be used. The gross profit method can be used only when there has been a virtually constant relation for several years between the cost of goods and the sales. The inventory is then approximated as follows:

Sales since last closing		xxx
Inventory at last closing	xxx	
Purchases since	xxx	
Gross profit at x%	*xxx*	*xxx*
Remainder is inventory lost		xxx

This inventory is credited to materials account to close the books and is debited to fire loss account.

Fire loss account, having been charged with all the property lost, must now be credited with salvage recovered and with money paid by the insurance companies. The balance of fire loss account is then transferred to the debit or credit of surplus. The balance may be a credit if the concern has charged off excessive depreciation, so as to bring the net carrying value below the insurance replacement value.

The total loss, the salvage, the settlement and the net result must be recorded in the fire loss account, and not in the salvage account. The fire was the important event and caused the loss—the salvage was only incidental.

If the salvage involved any transactions other than the mere sale of junk, etc., a salvage account should be opened. This account should be charged with the materials and labor required to render the salvaged articles salable and should be credited with the sales. The balance of the account should then be credited to fire loss account.

The use of the term voucher register is probably a slip of the pen. Sales are recorded in a sales register, not in a voucher register. However, the salvage sales should not be recorded in either register, unless the sales register has a sundries column from which the items can be posted to the credit of salvage account. These sales should be recorded by journal entries, except where they are made for spot cash, in which case they would appear in the cashbook only. The sales register should be used only for regular sales of the merchandise made by the factory.

INTEREST IN PART PAYMENTS

Editor, Students' Department:

SIR: What is the proper method of treating a mortgage note for $2,500.00 on which the mortgagee has the privilege of paying $20.00 monthly and interest at 6 per cent until paid? Would you give a receipt the first of every month for $20.00 as a part payment and charge or collect the interest at the end of each year? Would it be advisable to calculate the interest each month and specify in the receipt the amount applicable to principal and interest? R. L. R.

The proper treatment of payments of interest and principal on a mortgage note would depend entirely upon what the contract stated in regard to the distribution of monthly payments between principal and interest.

For instance, I have before me a note requiring the payment of $2,000 in the following manner: "The $2,000 is to draw interest at the rate of 6 per cent per annum and is to be paid as follows: the maker hereof is to pay to the said payee or order $40 on the first day of each and every month hereafter until the said sum of $2,000 and the interest thereon is fully paid; that is, the interest due from time to time on the unpaid balance is to be first deducted from said payment of $40 and the balance remaining is to be applied on account of the said principal sum of $2,000."

This recital clearly indicates what distribution is to be made of the monthly payments; and endorsement should be made on the note, showing the amount of the cash received for interest and the amount received on the principal. It would not be sufficient for the holder of the note to give a receipt for the payment because of the fact that the paper is a negotiable instrument and, if the part payments were not recorded on the note itself, the note might be sold by the holder and a holder in due course could enforce payment for the total note.

If it is the intention that the $20 monthly payment, in the case in question, is to apply entirely upon the principal, this should be endorsed on the note as an application against the principal. The question would then arise as to whether at the end of the year the debtor would pay interest on the principal outstanding at the beginning of the year or on the average principal outstanding during the year.

Unless specified differently in the contract, the interest to date on the then unpaid balance would have to be paid every month. The law is that interest takes precedence of principal, unless otherwise stipulated. That is, if the contract is silent as to when the interest shall be paid, any

payment made must first be applied to the payment of the interest accrued at that time and only the remainder will be applied in reduction of the principal. In the contract which we have mentioned this is plainly stated, probably to avoid misunderstanding, but it was not necessary to state it, as the procedure would have been the same in any case. On that contract the same payment of $40 is made every month, but the division between principal and interest varies thus:

1st	mo.	payment	$40.00;	interest	on	$2,000.00,	$10.00;	principal $30.00
2nd	mo.	"	40.00;	"	"	1,970.00	9.85;	" 30.15
3rd	mo.	"	40.00;	"	"	1,939.85	9.70;	" 30.30

and so on.

In the case cited by our correspondent the expression "$20.00 monthly and interest" can be construed to mean only that the interest is an addition to the $20.00, not that it is included in it. The payments and the interest would constantly decrease, but the reduction of principal would not vary, thus:

1st	mo.	payment	$32.50;	interest	on	$2,500.00,	$12.50;	principal $20.00
2nd	mo.	"	32.40;	"	"	2,480.00,	12.40;	" 20.00
3rd	mo.	"	32.30;	"	"	2,460.00,	12.30;	" 20.00

The law giving preference to interest is not at all well known to business men, and is seldom or never followed in ordinary commercial transactions, because the difference in the total interest is very small when the time is short and the amounts are not large. What is known as the commercial rule is usually followed. This requires the calculation of all the credit and all the debit items of interest separately and the payment of the difference. As an example take the following account:

Jan'y. 1,	Merchandise	1,200.00	Feb'y. 10,	Cash	800.00
March 2,	"	1,600.00	March 17,	"	1,100.00
May 1,	"	900.00	April 16,	"	700.00
			May 1,	"	300.00

It is proposed to settle this on June 30th with interest at 6 per cent. per annum calculated at 360 days to the year.

The commercial plan would be:

Dr.	$1,200	180 days	36.00	Cr.	$800	140 days	18.67
	1,600	120 "	32.00		1,100	105 "	19.25
	900	60 "	9.00		700	75 "	8.75
					300	60 "	3.00
			77.00				49.67

which shows a debit net of $27.33, and a total due of $827.33.

The legal or "United States" plan would be:

Jan'y. 1,	Debit		$1,200.00
Feb'y. 10,	Payment 800.00 less interest 40 days on 1,200.00	8.00	792.00
			408.00
March 2,	Debit		1,600.00

March 17,	Payment 1,100 less interest 20 days on	408.00, 1.36		2,008.00
	" " 15 " "	2,008.00, 5.02	6.38	1,093.62
				914.38
April 16,	Payment 700.00 less interest 30 days on 914.38		4.57	695.43
				218.95
May 1,	Debit, net			600.00
				818.95
June 30,	Interest 15 days on 218.95 .55, and 60 days on 818.95, 8.19			
			=8.74	8.74
	Amount due			827.69

This shows a difference of only 36 cents, which is considered negligible on such amounts.

In the example quoted by us the method pursued would leave at the end of the 57th month an amount due of $26.99. In the 57 months there would have been paid in at $40.00 per month $2,280.00. If the small balance were paid at once the total amount paid would be $2,306.99. By the commercial method the interest on $2,000.00 for 57 months would be $570.00, a total debit of $2,570.00. Against this there would be a credit of 57 times $40.00 or $2,280.00 and interest on the first $40.00 of $11.40, diminishing each month in arithmetical progression to 20 cents the last month, or $330.60, a total credit of $2,610.60. As the credit is $40.60 more than the amount due, while by the United States rule there is still $26.99 due, it is seen that the commercial rule in this case favors the borrower to the extent of $67.59 which is by no means a negligible amount on a $2,000 note.

Accountants and bookkeepers should be more familiar than they are with the laws of interest. They can often save their clients or employers considerable sums if they know the effect of the different methods of calculation.

NOTES OR BILLS PAYABLE

Editor, Students' Department:

SIR: Does the accounting profession differentiate between bills payable and notes payable not only practically but also theoretically? One party contends there is no difference; the other says there is, with the explanation that notes payable, are the regular promissory notes and should always bear interest and do not recite that they are given to liquidate a specific kind of transaction, merely value received, whereas a bill payable is a trade acceptance, a bill of exchange, certified cheque or accepted sight draft. G. Q. D.

The accounting profession has not differentiated as yet between notes payable and bills payable.

In England and in continental Europe drafts or bills of exchange have been a more customary method of handling credit transactions than notes payable. In England, where most of our accounting terminology origi-

nated, bills of exchange were much more common than notes; therefore they used the term bills payable and bills receivable, and whenever a few notes were given they were entered in the account with the bills.

In this country the custom has been exactly the reverse. We have been accustomed to giving notes rather than accepting bills of exchange; but we have used the English terminology of bills payable until recent times. Realizing that the term bills payable was not as appropriate in this country as in England, a movement has been on foot to change the terminology from bills payable to notes payable and this movement has met with considerable success so that the term notes payable rather than bills payable now frequently appears in balance-sheets.

Strictly speaking a promissory note is a note payable; a trade acceptance is a bill payable; but I am inclined to think that as trade acceptances become more prevalent they will be recorded in a trade acceptance account rather than a bills payable account.

The statement that notes payable should always bear interest is not correct. Interest is an immaterial detail which may be found in a bill of exchange or trade acceptance as well as in a note and is not essential to either. In an accounting sense bills payable are always notes or acceptances payable at a future date, and the term does not include cheques or sight drafts.

The objection to the term bills payable is that in this country many business men not being accustomed to bills of exchange think the term refers to the bills rendered by their creditors which are payable every month.

ANONYMOUS LETTERS

This department continues to receive anonymous letters asking for information. Unless name and address both are given, no attention is paid to such requests as a usual thing. It is to be noted that a letter signed J. L. W. with the address of New York is an anonymous letter.

If the enquirer does not wish his name used, he can sign any initials or anything else, provided he give his real name and address below with the request that they be not used. This request will always be granted.

Alabama Society of Certified Public Accountants

At a meeting held in Birmingham, Alabama, September 27, 1919, it was decided to organize the Alabama Society of Certified Public Accountants. H. S. Miller was elected president, and J. A. Harden secretary and treasurer.

Henry J. Falk

Henry J. Falk, president of the Colorado State Society of Certified Public Accountants, died in Denver, September 27th. Mr. Falk was a member of the American Institute of Accountants and was keenly interested in the development of the profession throughout the country.

John K. Laird and H. C. Goettsche announce the formation of a partnership under the firm name of Laird, Goettsche & Co. with offices at 431-5 Chicago Stock Exchange building, 30 North La Salle street, Chicago.

Warrel S. Pangborn announces that he has taken into partnership his son, L. Moss Pangborn, and that the firm name hereafter will be Pangborn & Pangborn, with offices at 30 Broad street, New York.

Banks, Haig & Co. announce that Fred W. Lindars has become a member of the firm, which will continue in practice under the name of Banks, Haig & Lindars at 150 Nassau street, New York.

Edward I. Petze & Co. announce the opening of offices at 118 Asylum street, Hartford, Connecticut, and 80 Broad street, New York.

Eli Moorhouse announces that he is now a member of the firm of John G. McIntosh & Co., 309-310 White building, Seattle, Washington.

Griswold & Conant announce the removal of their offices from 85 Devonshire street to Old South building, Boston, Massachusetts.

John J. Lang announces the opening of an office in La Salle building, Broadway and Olive street, St. Louis, Missouri.

E. F. Leathem & Co. announce the removal of their Birmingham, Alabama, office to the Brown-Marx building.

John J. C. Shelly announces the opening of an office at 505 Confederation Life building, Winnipeg, Manitoba.

John Y. Richardson announces the resumption of practice in the Concord Building, Portland, Oregon.

Arnold, Nold & Co. announce the opening of offices in the Andrus building, Minneapolis, Minnesota.

Puder & Puder announce the opening of a branch office in the Land Title building, Philadelphia.

Nau, Rusk & Swearingen announce the opening of a branch office at 280 Broadway, New York.

Joseph Gill announces the opening of an office at 2 Rector street, New York.